Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

FY 1990 SBIR SOLICITATION

PHASE I AWARD ABSTRACTS

ARMY PROJECTS

VOLUME I

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PREFACE

This report presents the technical abstracts of the Phase I proposals resulting in contract awards in Fiscal Year 1990 that were submitted to the Department of Defense (DoD) Small Business Innovation Research (SBIR) Program. The Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO) are the DoD components of the SBIR Program. Two solicitations inviting small business firms to submit proposals under this program were published in FY90. All six DoD components participated in Program Solicitation 90.1 (Closing Date: 5 January 1990), and Army, Navy, and DARPA participated in Program Solicitation 90.2 (Closing Date: 2 July 1990). The selection of proposals for funding was made from proposals received by the Military Services and Agencies.

FY 1990 SBIR PROGRAM

	Number of Topics		Proposals Received		Phase I Awards	
	90.1	90.2	90.1	90.2	90.1	90.2
Army	206	273	2482	2094	218	272
Navy	310	78	2132	520	334	78
Air Force	199	--	2524	--	233	--
DARPA	61	70	754	563	94	85
DNA	17	--	254	--	16	--
SDIO	15	--	710	--	97	--
Total	808	421	8856	3177	992	435
Grandtotal	1229		12033		1427	

Of the 1427 Phase I awards made in 1990, 180 awards went to minority-owned businesses and 113 awards were to woman-owned businesses. Overall, 11.9% of 1990 SBIR proposals were selected for funding, that is better than a 1 in 9 chance of receiving an award.

In order to make information available on the technical content of the Phase I projects supported by the DoD SBIR Program, four volumes containing the abstracts and contacts for the 1427 awarded projects are published. The small business information with accompanying abstract are arranged in topic number order. When more than one award was made for a given topic, the information is in alphabetical order by firm.

- Volume I contains Army Projects
- Volume II contains Navy Projects
- Volume III contains Air Force Projects
- Volume IV contains DNA, DARPA and SDIO Projects

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the firm whose name and address is shown.

In 1982, Congress enacted and the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219), which created the Small Business Innovation Research (SBIR) Program to give small, high-technology firms a greater share of the federally-funded research and development contract awards.

Under the SBIR Program, each federal agency with an extramural budget for research or research and development in excess of $100 million per fiscal year must establish an SBIR Program. The program is funded by setting aside 1.25 percent of the participating agency's extramural R&R&D contracting dollars. The agency's participating in the Department of Defense SBIR Program are Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Defense Nuclear Agency (DNA), and Strategic Defense Initiative Organization (SDIO).

The objectives of the DoD SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs, encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of up to one man-year effort over a period generally of six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. Successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. Proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally of 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and requires comprehensive proposal outlining the intended effort in detail.

Phase III is expected to involve private sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Proposals received in response to a DoD solicitation are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area. Selections for Phase I are made in accordance with the following four criteria:

- The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
- Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available of obtainable instrumentation and facilities.
- Anticipated benefits of the research to the total DoD research and development effort.
- Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized Public Law 97-219 (signed July 22, 1982) to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

ELECTRO-OPTEK CORP
3251 KASHIWA ST
TORRANCE, CA 90505
Program Manager: MICHAEL C LEE
Contract #:
Title: NIGHT SIGHT TARGET SENSOR FOR FIRE CONTROL
Topic #: A90-001 Office: ARDEC ID #: 39447

ADVANCED NIGHT SIGHT TARGET SENSORS USED IN TACTICAL WEAPONS FOR FIRE CONTROL REQUIRE DETECTOR ARRAYS THAT ARE LOW WEIGHT, LOW POWER AND CAN BE OPERATED AT ROOM TEMPERATURE WITH REASONABLE SENSITIVITY. TO MEET THESE REQUIREMENTS, AN INNOVATIVE TECHNIQUE IS PROPOSED FOR FABRICATING LARGE-AREA LONG WAVELENGTH INFRARED (LWIR) DETECTOR ARRAYS THAT CAN BE OPERATED AT ROOM TEMPERATURE. THIS TECHNIQUE UTILIZES ESTABLISHED TECHNOLOGIES OF MICRO-MACHINING AND MICROELECTRONIC PROCESSING OF SILICON (Si) WAFERS FOR FABRICATING MONOLITHIC ARRAYS OF LWIR DETECTORS. THE DETECTOR ELEMENTS OF THE ARRAY ARE FORMED BY AN ULTRA-THIN FILM OF A BOLOMETER MATERIAL PROCESSING THE HIGHEST TEMPERATURE COEFFICIENT OF RESISTANCE KNOWN, AND THE READOUT ELECTRONIC MICROCIRCUIT IS FABRICATED ON THE SAME SILICON CHIP NEXT TO THE ELEMENTS. THE RESULTANT DETECTOR ARRAYS WILL POSSESS FEATURES OF LOW COST, LOW WEIGHT, HIGH RESPONSIVITY AND HIGH SENSITIVITY. THE LOW COST IS DUE TO A SINGLE BATCH PROCESS IN THE ARRAY FABRICATION. THE LOW WEIGHT IS DUE TO A MONOLITHIC ARRAY STRUCTURE REQUIRING NO COOLING. THE HIGH RESPONSIVITY IS DUE TO A LARGE TEMPERATURE COEFFICIENT OF RESISTIVITY (>15% COMPARED TO 0.2% FOR A CONVENTIONAL BOLOMETER) OF OUR NEW BOLOMETER MATERIAL. THE HIGH SENSITIVITY IS DUE TO THE COMBINED EFFECTS OF HIGH RESPONSIVITY, LOW NOISE AND HIGH THERMAL ISOLATION OF THE BOLOMETER FROM ITS SURROUNDINGS.

BELTRAN INC
1133 - 35TH ST
BROOKLYN, NY 11210
Program Manager: THOMAS C KOSVIC
Contract #:
Title: GUN MUZZLE BLAST AND FLASH COMPUTER CODE
Topic #: A90-002 Office: ARDEC ID #: 39448

TECHNIQUES ARE BEING SOUGHT TO REDUCE GUN MUZZLE SIGNATURE. THE ELEMENTS OF THIS SIGNATURE ARE SHOCK WAVES AND VISIBLE LIGHT. THE SIGNATURE BETRAYS LOCATION, HINDERS GUN CREW PERFORMANCE, AND DETERIORATES GUN MECHANISMS. A COMPUTER CODE WILL BE DEVELOPED TO DESCRIBE THE KEY ELEMENTS OF THE SIGNATURE PROBLEM. EXISTING COMPUTER MODULES IN USE AT BELTRAN, INC. WILL EXPEDITE THE PROGRAM. THESE INCLUDE CHEMICAL EQUILIBRIUM, CHEMICAL KINETICS, COMBUSTION GAS PROPERTIES, AND MODERN GENERALIZED CFD CODES. THE MODEL WILL BE SET UP EMPLOYING PARALLEL PROGRAMMING TECHNIQUES.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
Program Manager: EDWARD B FISHER
Contract #:
Title: IGNITION OF HIGH ENERGY DENSITY CHARGES-LIQUID PROPELLANTS
Topic #: A90-003 Office: ARDEC ID #: 39449

THE HIGH-ENERGY DENSITY CHARACTERISTICS OF LIQUID AND GEL PROPELLANTS (AS WELL AS THEIR INHERENT POSSIBILITIES FOR LOW COST, IMPROVED LOGISTICS, AND GREATER SAFETY) HAVE EXCITED

INTEREST AMONG GUN- SYSTEM DEVELOPERS FOR OVER 40 YEARS, RESULTING IN A LARGE BODY OF BALLISTIC TEST DATA. RECENTLY, VERITAY HAS PERFORMED A SIGNIFICANT AMOUNT OF TESTING OF BULK-LOADED LIQUID, GEL AND SLURRY PROPELLANTS– USING BOTH ELECTRICAL AND PYROTECHNIC IGNITION CONCEPTS. WHILE VOLUMES OF DATA HAVE BEEN ACCUMULATED, RELATIVELY LITTLE ATTENTION HAS BEEN DEVOTED TO CHARACTERIZING THE MECHANISMS CRITICAL TO OBTAINING SAFE AND CONSISTENT BALLISTICS. ON-GOING WORK AT VERITAY–SPONSORED BY ARDEC AND OTHERS–SUGGESTS THAT PYROTECHNIC IGNITION MAY HAVE INHERENT VARIABILITY CHARACTERISTICS THAT ARE IMPEDING THE ACHIEVEMENT OF REPRODUCIBLE BALLISTICS. TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF EXERCISING GREATER CONTROL OVER THE IGNITION SEQUENCE, VERITAY PROPOSES TO CRITICALLY EXAMINE THE IGNITION PERIOD OF RECENT BALLISTIC TEST DATA TO IDENTIFY THE SOURCES OF VARIABILITY AND SUGGEST A MEANS FOR THEIR CONTROL. ELECTRICAL IGNITION SYSTEMS THAT PROVIDE ADEQUATE CIRCUITRY FOR CONTROLLING THE IGNITION EVENT WILL BE DEVISED AND DESIGNED, AND AN EXISTING LUMPED–PARAMETER INTERIOR BALLISTIC CODE WILL BE MODIFIED TO MODEL A SLATE OF CANDIDATE IGNITION CONCEPTS FOR THEIR BALLISTIC PERFORMANCE VARIABILITY.

KVH INDUSTRIES
110 ENTERPRISE CTR
MIDDLETOWN, RI 02840
Program Manager: A KITS VAN HEYNINGEN
Contract #:
Title: GPS COMPATIBLE AUTOMATIC CALIBRATION COMBAT VEHICLE DIGITAL COMPASS
Topic #: A90-004 Office: ARDEC ID #: 39450

KVH INDUSTRIES PROPOSES TO DESIGN A LOW COST DIGITAL FLUXGATE SENSOR SYSTEM TO PROVIDE: (1) DIRECTIONAL REFERENCE FOR PLATFORM FIRE CONTROL SYSTEMS; (2) INTEGRATED BACKUP NAVIGATION REFERENCE FOR THE GLOBAL POSITIONING SYSTEM. THE PRINCIPAL OBJECTIVE WILL BE IMPLEMENTATION OF FIELD CALIBRATION CAPABILITY TO ENSURE ACCURATE COMPASS PERFORMANCE ON ALL COMBAT VEHICLES. THE PROPOSED MICRO- PROCESSOR BASED SYSTEM WILL BE SMALL, LIGHTWEIGHT, RELIABLE, AND LOW COST. IT WILL PROVIDE ACCURATE (TO 20 MILS RMS) MAGNETIC REFERENCE ON ALL CLASSES OF LIGHT AND HEAVILY ARMORED ARMY TRACKED AND WHEELED VEHICLES, OVERCOMING MAGNETIC ANOMALIES OF ARMORED VEHICLES THROUGH THE USE OF AUTO-CALIBRATION. THE PROPOSED SYSTEM WILL NOT BE DEGRADED BY BATTLEFIELD COUNTERMEASURES. RELIABILITY OF GREATER THAN 30,000 HOURS MTBF, WITH BUILT IN TEST CAPABILITY, WILL ENSURE BACKUP FOR GPS NAVIGATION IN THE EVENT OF COUNTERMEASURE NEUTRALIZATION OR OTHER PRIMARY SYSTEM FAILURE. KVH WILL DEVELOP SOFTWARE ALGORITHMS TO DETERMINE THE MAGNITUDE AND ORIENTATION OF COMPENSATION EQUATIONS FOR (1) TOTALLY MAGNETIC COMPENSATION REQUIRING ONLY A 360 DEG TURN OF THE VEHICLE; (2) FIELD CALIBRATION FOR MAGNETIC ANOMALIES RESULTING FROM TURRENT MOVEMENT ON VEHICLES; (3) DESIGN AND IMPLEMENTATION OF A LOW PROFILE "MAGNETIC ANTENNA".

STRAINOPTIC TECHNOLOGIES INC
108 W MONTGOMERY AVE
NORTH WALES, PA 19454
Program Manager: ALEX S REDNER
Contract #:
Title: DEVELOPMENT OF BROADBAND-ULTRASONIC PULSE METHOD FOR MEASURING RESIDUAL STRESSES AND THEIR GRADIENTS
Topic #: A90-005 Office: ARDEC ID #: 39451

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP A METHOD FOR MEASURING RESIDUAL STRESS GRADIENTS IN THE WALL OF ARTILLERY SHELLS, BASED ON A NOVEL ACOUSTO-ELASTIC APPROACH, USING A BROADBAND ULTRASONIC SIGNAL AND SURFACE-HUGGING GUIDED WAVE MODES.

THE RESEARCH WILL INCLUDE THE DEVELOPMENT OF SUITABLE TOOLS AND SOFTWARE FOR DATA ANALYSIS. IT IS ALSO PROPOSED HERE TO DEVELOP AN ULTRASONIC STRESS-ROSETTE TO EVALUATE PRINCIPAL STRESS DIRECTION. AS A RESULT OF THE PROPOSED RESEARCH, IT IS HOPED THAT A NEW METHOD WILL BE DEMONSTRATED, CAPABLE OF SOLVING MANY RESIDUAL-STRESS ANALYSIS PROBLEMS. SUCH A TOOL SHOULD FIND AN EXTENSIVE APPLICAATION BOTH IN GOVERNMENT AND INDUSTRIAL LABORATORIES.

CAPE COD RESEARCH INC
PO BOX 600 - 95 MAIN ST
BUZZARDS BAY, MA 02532
Program Manager: DR BRIAN G DIXON
Contract #:
Title: A SINGLE STEP FIRE PROTECTIVE AND PRESERVATIVE TREATMENT FOR WOOD
Topic #: A90-006 Office: ARDEC ID #: 39452

THE PROPOSED RESEARCH INVESTIGATES THE FEASIBILITY OF DEVELOPING A SINGLE STEP WOOD TREATMENT THAT WILL RESULT IN THE WOOD BEING PRESERVED FROM BIOLOGICAL DEGRADATION AND PROTECTED FROM THE RAVAGES OF FIRE AS WELL. THE NOVEL APPROACH INCLUDES THE IRREVERSIBLE IMMOBILIZATION OF THE VARIOUS TREATMENT CHEMICALS WITHIN THE CELLULOSIC STRUCTURE OF THE WOOD. THIS WILL ALLOW FOR THE LONG TERM PROTECTION OF THE WOOD BY PREVENTING THE OCCURRENCE OF LEACHING IN HUMID ENVIRONMENTS. IN ADDITION, THE NEW FORMULATION WILL BE SAFE TO HANDLE.

CYBER-OPTICS CORP
2311 UNIVERSITY AVE SE
MINNEAPOLIS, MN 55414
Program Manager: PAUL R HAUGEN
Contract #:
Title: HIGH-SPEED INSPECTION SYSTEM FOR 5.56 CARTRIDGE CASINGS
Topic #: A90-007 Office: ARDEC ID #: 39453

TO ENSURE RELIABLE PRODUCTION OF CARTRIDGE CASINGS, CRITICAL DIMENSIONS, SUCH AS THE PLACEMENT AND SIZE OF THE PRIMER CUP AND VENT HOLE, MUST BE ACCURATELY MAINTAINED. CURRENTLY, THERE IS NO ABILITY TO MEASURE CRITICAL DIMENSIONS OF THE PRIMER CUP DURING THE PRODUCTION OF THE 5.56mm CARTRIDGE CASING. IN THIS PROPOSAL, CYBER-OPTICS DESCRIBES A PROGRAM TO DEVELOP A PROTOTYPE INSPECTION STATION TO MEET THE NEEDS OF 5.56mm CARTRIDGE PRODUCTION PROGRAM. DURING THIS PROGRAM, AN INSPECTION SYSTEM BASED ON A HIGH-SPEED, NON-CONTACT LASER RANGE SENSOR WILL BE DESIGNED AND FABRICATED. THE RESULTS OF PHASE I WILL INCLUDE AN ANALYSIS OF THE MEASUREMENT PROBLEM, A FABRICATION OF A PROTOTYPE SENSOR AND A DESIGN OF A HIGH-SPEED SENSOR SYSTEM TO BE FABRICATED DURING PHASE II OF THIS PROGRAM.

INDUSTRIAL QUALITY INC
PO BOX 2519/19634 CLUB HOUSE RD-STE 320
GAITHERSBURG, MD 20879
Program Manager: EDWIN S GAYNOR
Contract #:
Title: RADIOGRAPHIC IMAGE PREDICTION AND COMPUTER MODELING
Topic #: A90-008 Office: ARDEC ID #: 39454

ARMY ARMAMENT DEVICES ARE CONTROLLED FOR SAFETY AND OPTIMUM PERFORMANCE BY A COMPLEX FUZE MECHANISM. FUZES ARE DESIGNED BY COMPUTER AIDED DESIGN (CAD), FABRICATED BY HAND,

AND TRANSPORTED SEPARATELY FROM THE EXPLOSIVE CHARGE OF THE ARMAMENT FOR SAFETY. EACH FUZE IS INSPECTED BY X-RADIOSCOPY. THE PRESENT RADIOSCOPIC METHOD IS EMBODIED IN THE AUTOMATIC FUZE INSPECTION BY RADIOGRAPHY SYSTEM (AFIRS), WHICH USES FEATURE RECOGNITION TECHNIQUES TO DETECT FUZE MISASSEMBLY FLAWS. THE REFERENCE PATTERNS FOR THE FEATURE RECOGNITION PROCESSOR COMPRISE ACTUAL RADIOSCOPIC IMAGES OF PROPERLY AND IMPROPERLY ASSEMBLED FUZES. STATISTICAL INFORMATION IS CALCULATED FROM THE IMAGES AND USED IN THE PROCESS. THE DATABASE IS DIFFICULT TO COMPILE SINCE FLAWS MUST BE HAND-FABRICATED INTO FUZES. THIS PROPOSAL IDENTIFIES THIS PROBLEM AND OFFERS A SOLUTION IN RADIOSCOPIC IMAGE MODELING. MODELLED IMAGES INTRODUCE IMPROVED DATABASE COMPILATION SINCE THERE IS NO HAND-FABRICATION INVOLVED AND THUS THE DATABASE CAN BE LARGER AND MORE REPRESENTATIVE OF THE FUZE COMPONENTS AND ASSOCIATED FLAWS. PHASE I WORK WILL AIM TO DEVELOP A CAD GRAPHICS FUZE DESCRIPTION WHICH ACCOMPLISHES SIMULATED INSPECTION BY INTERFACE TO SOURCE MODELING SOFTWARE, OBJECT ATTENUATION DATA, AND DETECTOR RESPONSE CHARACTERISTICS. IN PHASE II, WE WILL FURTHER DEVELOP THE RADIATION MODEL AND INTERFACE TO AFIRS TO DEMONSTRATE IMPROVED FUZE INSPECTION CAPABILITY.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: DEBRA BANNING
Contract #:
Title: COMPUTER VIRUS PREVENTION FOR EMBEDDED COMPUTER WEAPON SYSTEMS
Topic #: A90-009 Office: ARDEC ID #: 39455

MODERN WEAPON SYSTEMS MAKE EXTENSIVE USE OF EMBEDDED COMPUTER SYSTEMS FOR SUCH CRITICAL FUNCTIONS AS WEAPON AIMING, WEAPON SENSOR PROCESSING AND GUIDANCE, SAFE AND ARMING, AND REAL-TIME CONTROL. THE EXECUTIVION OF THESE FUNCTIONS IS DEPENDENT UPON THE CORRECT OPERATION OF THE SOFTWARE THAT RUNS ON THE EMBEDDED COMPUTERS. RECENTLY, CONCERN HAS BEEN RAISED OVER THE POTENTIAL FOR SABOTAGE OF WEAPONS BY THE INSERTION OF MALICIOUS CODE, EITHER DIRECTLY INTO THE WEAPON APPLICATION CODE OR INDIRECTLY VIA THE APPLICATION SOFTWARE DEVELOPMENT ENVIRONMENT. VIRUSES PROVIDE AN INDIRECT PATH WHICH THE SABOTEUR MAY EXPLOIT TO INTRODUCE MALICOUS CODE INTO CRIFICAL SOFTWARE SYSTEMS. THIS STUDY WILL EXAMINE THE VULNERABILITY OF WEAPON SYSTEM SOFTWARE TO VIRUSES AND IDENTIFY APPROACHES FOR MINIMIZING THE THREAT. THE PROPOSED APPROACH IS TO IDENTIFY INDIRECT PATHS FOR INTRODUCING MALICIOUS CODE INTO WEAPON SYSTEM SOFTWARE, AND TO IDENTIFY HOW A VIRUS CAN BE CONSTRUCTED TO EXPLOIT EACH PATH. OUR APPROACH MAKES USE OF PRIOR WORK IN DEVELOPING TAXONOMIES OF COMPUTER VIRUSES AND THEIR COUNTERMEASURES, AND EXTEND THIS TO THE REALM OF EMBEDDED WEAPON CONTROL COMPUTERS.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC
84 OAK ST
BINGHAMTON, NY 13905
Program Manager: TIMOTHY D MASTERS
Contract #:
Title: ADVANCED TRACKER DEVELOPMENT USING FUZZY SET DETECTOR THE FOURIER- MELLIN TRANSFORM AND AN ARTIFICIAL NEURAL NETWORK CLASSIFIER
Topic #: A90-010 Office: ARDEC ID #: 39456

ADVANCED TRACKING WITH ATTITUDE INFORMATION IS PROPOSED BY ANDRISANI AND KHUL (1985) FOR AIRPLANES. ORIENTATION EXTRACTION IN REAL TIME CAN IMPROVE GROUND VEHICLE TRACKING. WE PROPOSE USING TWO FILTERS TO ACCOMPLISH THE TASK: ONE TO PERFORM REAL TIME PHYSICAL TRACKING, AND THE OTHER TO PERFORM LEAD ANGLE PREDICTION. BOTH FILTERS ARE CONTROLLED BY ONE ATR SYSTEM WHICH PERFORMS TARGET DETECTION IN REAL TIME, AND ORIENTATION EXTRACTION

AT A COARSER TIME INTERVAL. FOURIER BASED SHAPE MATCHING OFTEN YIELDS INCORRECT ORIENTATION FOR ITS ORIENTATION INVARIANT PROPERTY; HENCE THE FOURIER-MELLIN TRANSFORM IS PROPOSED AS AN ALTERNATIVE. IN ADDITION, THE SR&E NEURAL NETWORK WILL BE USED TO PERFORM SHAPE MATCHING BECAUSE IT IS NOT ORIENTATION INVARIANT. SINCE OUR TARGET DETECTOR IS A PIXEL BASED FUZZY SET ANALYZER, TRACKING CAN BE ACHIEVED IN REAL TIME. IN ADDITION, SINCE SEGMENTATION IS THE SUM OF DETECTED PIXELS, SHAPE MATCHING FOR BUILDING THE SECOND FILTER CAN BE EXPECTED IN REAL TIME AS WELL. THE FEASIBILITY OF THIS PROPOSED DUAL-FILTER TRACKING WILL BE TESTED WITH PHASE I EFFORT.

SILICON DESIGNS INC
1445 NW MALL ST
ISSAQUAH, WA 98027
Program Manager: JOHN C COLE
Contract #:
Title: AN IMPROVED FUSIBLE LINK FOR FASCAM MINES
Topic #: A90-011 Office: ARDEC ID #: 39457

CURRENT MICROFUSES FOR FASCAM MINES, WHOSE DESIGN IS SIMILAR TO MINIATURE DETONATORS OR SQUIBS, HAVE RELIABILITY PROBLEMS. THIS RESULTS IN MINES WHICH SELF-DESTRUCT EARLY, REDUCING MINEFIELD EFFECTIVENESS, OR LATE, ENDANGERING FRIENDLY TROOPS MOVING INTO THE AREA. MINIATURE DETONATORS USING THIN BRIDGEWIRES ALSO HAVE RELIABILITY PROBLEMS. USING INTEGRATED CIRCUIT TECHNOLOGY, SILICON DESIGNS HAS DEVELOPED A REPLACEMENT FOR BRIDGEWIRES USING THIN METAL FILMS ON A SUBSTRATE. THESE THIN-FILM BRIDGES APPEAR TO SOLVE DETONATOR RELIABILITY PROBLEMS. DETONATORS USING THIS TECHNOLOGY ARE CURRENTLY BEING QUALIFIED BY THE NAVY. WE PROPOSE TO APPLY THIS SAME TECHNOLOGY TO FUSIBLE LINKS IN TWO STEPS. FIRST, WE PROPOSE TO DEVELOP A FORM, FIT AND FUNCTION REPLACEMENT FOR THE EXISTING DESIGN, REPLACING THE THIN TUNGSTEN WIRE WITH A RELIABLE THIN-FILM BRIDGE CHIP. AS A SECOND STEP, WE PROPOSE TO DEVELOP A UNIT THAT COMBINES MULTIPLE MICROFUSES IN ONE HERMETIC PACKAGE USING THE HIGH-VOLUME, LOW-COST ASSEMBLY METHODS OF MICROELECTRONICS INDUSTRY.

UCE INC
35 ROCKLAND RD
NORWALK, CT 06854
Program Manager: M LEIBOWITZ
Contract #:
Title: CURVED LCD FOR MULTI-OPTION FUZING APPLICATIONS
Topic #: A90-012 Office: ARDEC ID #: 39458

UCE PLANS TO CONCENTRATE ON HEMATICITY FOR RELIABILITY (VS MOISTURE). UCE HAS WORKING EXPERIENCE WITH FRIT AND PLASTIC SEALS. THERE ARE TWO "BEST" APPROACHES; CURVED DISPLAY, OR THIN GLASS DISPLAY LAMINATED IN PLASTIC FOR STRENGTH. ALTERNATIVELY THE HYBRID OF A LAMINATED THIN GLASS PACKAGE WITH A LIQUID CRYSTAL IN A PLASTIC EMULSION IS A PREFERRED CONFIGURATION FOLLOWED BY A CURVED GLASS CUSTOM PACKAGE. CURRENTLY AVAILABLE PLASTICS WILL NOT MEET THE RELIABILITY REQUIREMENTS OF THE APPLICATION.

CAMDEC
3002 DOW AVE - STE 110
TUSTIN, CA 92680
Program Manager: DR L SHENFIL
Contract #:

Title: HYBRID CHARGE FOR LOW COST COMVAT CASED TELESCOPED AMMUNITION
Topic #: A90-013 Office: ARDEC ID #: 39459

A HYBRID PROPELLING CHARGE, CONSISTING PARTLY OF CONSOLIDATED CONVENTIONAL GRANULAR PROPELLANT AND PARTLY OF A MONOLITHIC GRAIN OF VERY HIGH BURN RATE (VHBR) PROPELLANT, IS PROPOSED FOR USE IN THE 45 mm CASED TELESCOPED AMMUNITION FOR THE COMVAT SYSTEM. SUFFICIENT INFORMATION EXISTS ON THE PERFORMANCE OF VHBR PROPELLANTS IN MONOLITHIC GRAIN PROPELLING CHARGES TO ESTABLISH HIGH CONFIDENCE IN PREDICTING PERFORMANCE AND IN OVERCOMING THE TYPICAL RELATED IGNITION PROBLEMS. CAMDEC HAS WRITTEN A PROGRAM TO MODEL PERFORMANCE WHICH SHOWS THAT THE PRESENT CASED TELESCOPED ROUNDS CAN BE CONSIDERABLY DOWNSIZED, OR CAN FIRE HEAVIER PROJECTILES AT NO INCREASE IN CARTRIDGE SIZE OR CHAMBER PRESSURE. FURTHER, THE VHBR PROPELLANTS ARE VERY PRODUCIBLE AND OFFER A POTENTIAL LOW COST CASTABLE OR EXTRUDABLE CHARGE FOR CASED TELESCOPED AMMUNITION. ALTHOUGH NOT FULLY EVALUATED WITH RESPECT TO VULNERABLY, PRELIMINARY DATA SHOW LOVA CHARACTERISTICS. THE OBJECTIVES OF THIS PROGRAM ARE TO DEMONSTRATE HYBRID CHARGE PERFORMANCE IN 30 mm CONVENTIONAL AMMUNITION, AND TO GENERATE DESIGNS FOR IMPROVED PERFORMANCE 45 mm CASED TELESCOPED AMMUNITION.

GRADIENT LENS CORP
207 TREMONT ST
ROCHESTER, NY 14608
Program Manager: C BENJAMIN WOOLEY
Contract #:
Title: ENHANCED LASER EYE PROTECTION USING AXIAL INDEX OF REFRACTION GRADIENTS AND DIFFRACTIVE OPTICAL ELEMENTS
Topic #: A90-014 Office: ARDEC ID #: 39460

THE PRIMARY OBJECTIVE OF THIS DEVELOPMENT PROJECT IS TO IMPROVE THE DESIGNS FOR DIRECT VIEW OPTICAL SIGHTS WHICH INCORPORATES NON-LINEAR OPTICAL SWITCHES, SACRIFICAL MIRRORS OR OTHER OPTICAL LIMITERS PLACED IN THE FOCAL PLANE TO PROVIDE LASER EYE PROTECTION. THIS IS DONE BY INCREASING THE SPEED OF THE OBJECTIVE LENSES USING AXIAL INDEX OF REFRACTION GRADIENTS AND DIFFRACTIVE OPTICAL ELEMENTS. THESE DESIGNS AND THEIR MANUFACTURING FEASIBILITY WILL BE COMPARED WITH EACH OTHER AND WITH HOMOGENEOUS SPHERIC AND ASPHERIC DESIGNS. DESIGN RULES FOR AXIAL GRADIENTS AND DIFFRACTIVE OPTICAL ELEMENTS AS REPLACEMENTS FOR ASPHERIC SURFACES ARE GIVEN.

SPECTRUM MANAGEMENT GP INC
3211 JERMANTOWN RD - STE 401
FAIRFAX, VA 22030
Program Manager: DR NICHOLAS LAWRENCE
Contract #:
Title: RADIOGRAPHIC IMAGE PROCESSING USING INNOVATIVE NEURAL NETWORK TECHNOLOGY
Topic #: A90-015 Office: ARDEC ID #: 39461

OUR FIRM HAS UNIQUE EXPERIENCE IN CHARACTERIZING AND CLASSIFYING PATTERNS. OUR PROPRIETARY TECHNOLOGY ORIGINATED MORE THAN TWENTY YEARS AGO IN PERCEPTRON THEORY, AND WE HAVE BEEN QUIETY AND SUCCESSFULLY APPLYING IT FOR YEARS. THE EMERGING NEURAL NETWORK TECHNOLOGY PROMISES IN HARDWARE THINGS WE HAVE BEEN DOING IN SOFTWARE FOR A LONG TIME, AND OUR ENGINES CAPTURE SOME OF THESE THINGS. WE WOULD LIKE TO APPLY OUR MATURE NEURAL-NETWORK-LIKE TECHNOLOGY TO RADIOGRAPHIC IMAGE PROCESSING TO SEE IF SOME OF THE SPECTACULAR RESULTS WE HAVE OBTAINED IN OTHER, SIMILAR FIELDS WILL CARRY OVER HERE.

GUMBS ASSOCS INC
11 HARTS LN
EAST BRUNSWICK, NJ 08816
Program Manager: DR RONALD W GUMBS
Contract #:
Title: ELECTRONICS ENCAPSULATION USING CONDUCTING POLYMER COATINGS
Topic #: A90-016 Office: ARDEC ID #: 39462

THIS PROPOSAL OUTLINES A RESEARCH AND DEVELOPMENT PROGRAM TO COAT ELECTRONICS ENCAPSULATING MATERIALS WITH CONDUCTING POLYMERS TO PROVIDE SHIELDING FROM RADIATED ELECTROMAGNETIC RADIATION. THE SHIELDING PROPERTIES OF DIFFERENT CONDUCTING POLYMERS AT DIFFERENT THICKNESSES TO MICROWAVE ENERGY WILL BE TESTED AND ANALYZED. THE EFFECT OF COMBINING OR LAYERING MATERIALS WILL BE INVESTIGATED. DURING PHASE II A MINIMUM OF 25 FASCAM ANTI-TANK ASSEMBLIES WILL BE ENCAPSULATED WITH IMPROVED MATERIALS AND SUBJECTED TO MICROWAVE ENERGY. A PRIMARY OBJECTIVE IS TO DEVELOP PROCESSIBLE CONDUCTING POLYMERS WITH HIGH ELECTRICAL CONDUCTIVITY AND GOOD ENVIRONMENTAL STABILITY. THE EMI SHIELDING EFFECTIVENESS DEPENDS DIRECTLY ON THE CONDUCTIVITY OF THE POLYMER.

EL DORADO ENGINEERING INC
3460 S REDWOOD RD
SALT LAKE CITY, UT 84119
Program Manager: KENNETH T SMITH
Contract #:
Title: REMOTE PROCESSING OF LEAD STYPHNATE
Topic #: A90-017 Office: ARDEC ID #: 39463

IDENTIFY CANDIDATE OPERATIONS IN LEAD STYPHNATE WASHING AND PROPORTIONING OPERATIONS TO WHICH ROBOTICS MAY BE APPLIED. OBJECTIVES INCLUDE REMOVAL OF PERSONNEL FROM HAZARDOUS LOCATIONS; IMPROVED SAFETY, AND DEVELOPMENT OF ROBOTICS SUITABLE FOR HAZARDOUS LOCATIONS. PROJECT WILL IDENTIFY AND RANK OPERATIONS; DEVELOP DESIGN CONCEPTS USING COMMERCIAL ROBOTS (OFF-THE-SHELF OR MODIFIED); EXAMINE SAFETY CONSIDERATIONS AND OPERATIONAL BENEFITS; AND PROVIDE ENGINEERING COST ESTIMATES FOR IMPLEMENTATION.

INTELLIGENT MICRO SYSTEMS INC
1249 GREENTREE
NARBERTH, PA 19072
Program Manager: DR ALICE B SCANDURA
Contract #:
Title: IMPROVING RAM IN LARGE SYSTEMS BY COMBINING THE WATERFALL AND RAPID PROTOTYPING MODELS
Topic #: A90-018 Office: ARDEC ID #: 39464

DEVELOPMENT METHODS AND TOOLS ARE NEEDED WHICH BOTH REDUCE DEVELOPMENT COSTS AND FACILITATE COMMUNICATION BETWEEN DEVELOPERS AND MAINTAINERS THROUGHOUT THE LIFE CYCLE. WE PROPOSE TO SCRUTINIZE FUNDAMENTAL ASSUMPTIONS UNDERLYING CURRENT DEVELOPMENT METHODS AND SUPPORTING TOOLS TO DETERMINE THE IMPLICATIONS OF THESE ASSUMPTIONS WITH RESPECT TO RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAM) AND THE ASSOCIATED COSTS. WE PROPOSE AN IMPROVED APPROACH TO SYSTEMS DEVELOPMENT WHICH COMBINES ADVANTAGES OF THE "WATERFALL" AND "RAPID PROTOTYPING" MODELS. OUR PROPOSED RESEARCH: 1) INVOLVES COMPLETE ANALYSIS AND EXTENSIBLE DESIGNS, 2) IS APPLICABLE TO BOTH LARGE AND SMALL SYSTEMS, 3) PROVIDES A CONCRETE "PAPER TRAIL", 4) MAKES IT EASY TO ASSESS PROGRESS, 5) MAKES IT EASY TO MAINTAIN CONSISTENCY AMONG LIFE CYCLE PHASES, AND 6) TREATS TESTING AS AN INTEGRAL PART OF

DEVELOPMENT. THIS APPROACH BY DESIGN AVOIDS MANY LIMITATIONS OF "WATERFALL" AND "RAPID PROTOTYPING" CONSIDERED INDIVIDUALLY.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: LEVENT OZAKCAY
Contract #:
Title: METAL FIBRE FABRICS WITH SELECTIVE COATINGS
Topic #: A90-019 Office: BRDEC ID #: 39465

BETTER SURVEILLANCE TECHNIQUES AND EQUIPMENT HAVE PLACED INCREASED DEMANDS ON THE DECOY MATERIALS. PARTICULARLY THE MODERN SENSORS UTILIZED IN THE VISIBLE AND INFRARED SPECTRUMS HAVE EXCELLENT RESOLUTION. THEREFORE, MATERIALS WITH LOW REFLECTANCE IN THE VISIBLE SPECTRUM AND LOW EMITTANCE ARE REQUIRED TO REDUCE THE CHANGE OF DETECTION. THE PROPOSED BLACK CHROME COATED METAL FABRIC SATISFIES THE PROPERTIES MENTIONED ABOVE. THE METAL FIBRE FABRICS ARE MANUFACTURED FROM VERY FINE FILAMENT YARNS MADE OUT OF 316 STAINLESS STEEL. THE RESULTING KNITTED OR WOVEN FABRIC IS STRONG, DURABLE, MILDEW RESISTANT, SUITABLE FOR LONG TERM STORAGE, AND HAS EXCELLENT ELECTROMAGNETIC PROPERTIES. THE OPTICAL CHARACTERISTICS OF THE STAINLESS STEEL ARE ALTERED BY A BLACK CHROME COATING WITH A DULL NICKEL BASE. THE FINAL SOLAR SPECTRUM REFLECTANCE IS LESS THAN 5% AND THE INFRARED EMISSIVITY IS IN THE ORDER OF 0.1. SPARTA/STI DIVISION HAS THE NECESSARY EXPERTISE TO MANUFACTURE THE PROPOSED BLACK CHROME COATED METAL FIBRE FABRIC.

APTEK INC
1257 LAKE PLAZA DR
COLORADO SPRINGS, CO 80906
Program Manager: KENNETH E SIEGENTHALER
Contract #:
Title: LIGHTWEIGHT FOOTBRIDGE CONCEPTS
Topic #: A90-020 Office: BRDEC ID #: 39467

THIS PROPOSAL DESIGNS A MAN PORTABLE AND DEPLOYABLE FOOTBRIDGE WITH THE BRIDGING CAPABILITY TO CROSS A 20 METER DRY GAP AND AN UNLIMITED WET GAP. THE BRIDGE IS DEPLOYABLE QUICKLY AND QUIETLY, AND ONLY REQUIRES ACCESS TO ONE SIDE OF THE GAP. THE DESIGN USES NEW LIGHTWEIGHT, HIGH-STRENGTH MATERIALS ALONG WITH STATE-OF-THE-ART COMPUTER OPTIMIZATION TECHNIQUES TO MAXIMIZE LOAD TO BRIDGE WEIGHT RATIOS. VARIOUS COMBINATIONS OF THE FOOTBRIDGE TRUSSES CAN EVEN BE USED TO BUILD A SMALL VEHICLE BRIDGE. THE STUDY CONDUCTED IN THIS PROPOSAL WILL DEMONSTRATE THE FEASIBILITY OF THE CONCEPT, BUILD A DEMONSTRATION MODEL TO ILLUSTRATE THE CONCEPT, AND WRITE A COMPREHENSIVE FINAL REPORT INCLUDING AN ANALYSIS OF THE STRUCTURE, MATERIALS AND DRAWINGS.

FASTSPAN INC
5875 W PORTLAND DR
LITTLETON, CO 80123
Program Manager: JOHN K BRIGHT
Contract #:
Title: FASTSPAN LIGHTWEIGHT FOOTBRIDGE CONCEPT
Topic #: A90-020 Office: BRDEC ID #: 39466

THE FASTSPAN LIGHTWEIGHT BRIDGE CONCEPT EMPLOYS A FOLDING PANTOGRAPH RECTANGULAR PANEL SYSTEM IN FOUR SECTIONS, 5m EACH LONG WHICH JOIN TOGETHER, WITH A 2 PIECE HEXCELL SANDWICH

DECK SYSTEM WHICH IS EMPLACED AFTER CANTELEVER DEPLOYMENT OF THE FRAME STRUCTURE AND WITH RAMP END-FRAMES. IT IS ANTICIPATED THAT THE BRIDGE WILL BE PACKAGED IN 9 APPROXIMATELY 23 Kg. PACKS FOR ERECTION BY LIGHT INFANTRY SQUAD. MULTIPLES OF THE 20m BRIDGE, EACH WITH AN INFLATABLE FLOTATION DEVICE AND ANCHORAGE SYSTEM IS PROPOSED FOR WET GAP CROSSING OF ANY LENGTH. DEPLOYMENT CAN BE SILENT. TRI LATERAL CODE REQUIREMENTS ARE MET.

ENERGY COMPRESSION RESEARCH CORP
910 CAMINO DEL MAR - STE A
DEL MAR, CA 92014
Program Manager: OVED S F ZUCKER
Contract #:
Title: LONG PULSE SOLID STATE HIGH POWER MICROWAVE SOURCE
Topic #: A90-021 Office: BRDEC ID #: 39468

THIS PROPOSAL REVIEWS THE PRESENTLY AVAILABLE SOLID STATE DEVICES AND SHOWS THAT VERY HIGH POWER MICROWAVE ENERGY CANNOT BE ECONOMICALLY PRODUCED BY THEIR USE. THE NEWLY EMERGING LIGHT ACTIVATED SEMI- CONDUCTOR SWITCH (LASS) IS SHOWN TO BE CAPABLE OF PRODUCING THE POWER LEVELS OF 100MW AND ABOVE. THESE ARE THE LEVELS NEEDED FOR RADIATING COUNTERMINE APPLICATIONS. THE CIRCUIT TECHNIQUES NEEDED TO ALLOW THE LASS TO PRODUCE STABLE REPRODUCIBLE LONG MICROWAVE PULSES ARE DESCRIBED. A SYSTEM EMPLOYING A Nd:YAG LASER TO SEQUENTIALLY TURN ON A SERIES OF LASS DEVICES IS ALSO DESCRIBED AND SHOWN TO BE CAPABLE OF OPERATING WITH AN EFFICIENCY OF GREATER THAN THIRTY PERCENT. A PROGRAM IS OUTLINES IN WHICH THE SPECIFICATIONS OF A COUNTER MINE WEAPON WILL BE DRAWN UP. VARIOUS CIRCUIT SCHEMES EMPLOYING THE LASS WILL BE STUDIED AS CANDIDATES FOR PRODUCING LONG PULSES OF VERY HIGH POWER MICROWAVE ENERGY. A CONCEPTUAL DESIGN WILL BE SELECTED AND THE SIZE, WEIGHT AND PROJECTED COST WILL BE DERIVED AND A RISK ANALYSIS AND TRADE OFF STUDY CONDUCTED. A PLAN TO VERIFY THE CONCEPTUAL DESIGN DURING A PHASE II EFFORT WILL BE PROPOSED.

INFORMATION TECHNOLOGY & APPLICATIONS
1800 ALEXANDER BELL DR - STE 105
RESTON, VA 22091
Program Manager: DR RODERICK J PEJSAR
Contract #:
Title: TACTICAL FORCES C3IEW SPACE SURVEILLANCE COUNTERMEASURES
Topic #: A90-022 Office: CECOM ID #: 39470

POTENTIAL ADVERSARIES USING COMMERCIALLY-AVAILABLE, SPACE SURVEILLANCE SYSTEMS CAN POSSIBLY CIRCUMVENT OTHERWISE EFFECTIVE FORCE MANAGEMENT ACTIVITIES. AN EVALUATION OF SUCH SPACE SYSTEMS IS PROPOSED, ALONG WITH DEVELOPMENT OF A MEANS TO EQUIP COMMANDERS WITH THE READY CAPABILITY TO EFFECTIVELY COUNTER SUCH SYSTEMS. THE PROPOSED STUDY LOOKS AT THE TECHNICAL CAPABILITIES AND OPERATIONS OF NON-MILITARY, SPACE SURVEILLANCE SYSTEMS, AND EVALUATES THESE SYSTEMS WITH RESPECT TO CORPS OF DIVISION UNIT/EQUIPMENT SURVEILLANCE-RELATED PARAMETERS, EMISSION SPECTRA AND TIME-SENSITIVITIES. THE STUDY THEN ASSIMILATES INFORMATION ON U.S. AND CERTAIN FOREIGN COUNTERMEASURES AND CCD CURRENTLY EMPLOYED TO FRUSTRATE SURVEILLANCE AND SIMILAR TECHNICAL SYSTEMS. THIS ALLOWS THE QUICK GAIN OF A VALIDATED BASE- LINE OF COUNTERMEASURES CONCEPTS, TECHNOLOGIES AND APPLICATIONS. AT ABOUT THE SAME TIME, CURRENT TARGET-SIGNATURE DATABASES ARE SURVEYED TO GAIN TECHNICAL INSIGHT INTO PARAMETRIC CHARACTERISTICS OF DEPLOYED UNITS AND EQUIPMENTS AND TO SCOPE THE APPLICABILITY OF COUNTERMEASURES CONCEPTS. ALL GATHERED INFORMATION IS CORRELATED TO DETERMINE SPECIFIC IMPACTS ON CRITICAL FORCE OPERATIONS AND TO DEVELOP BEST CONCEPTS FOR COUNTERING SURVEILLANCE. THE RESULTS ARE THEN APPLIED TO AN ALREADY-EXISTING COMPANY CAPABILITY WHICH PROVIDES, AS A SPECIAL CONTRACT END-PRODUCT ITEM, THE

RAPID-PROTOTYPING AND DEMONSTRATION OF A LOW-COST WORKSTATION-BASED TOOL AVAILABLE FOR USE AT ALL LEVELS IN THE FIELD TO GUIDE SURVEILLANCE COUNTERMEASURES APPLICATIONS.

MIRAGE SYSTEMS INC
8618 WESTWOOD CENTER DR - STE 110
VIENNA, VA 22180
Program Manager: MARC ROBERTS
Contract #:
Title: SPACE BASED BATTLEFIELD DECEPTION STUDY
Topic #: A90-023 Office: CECOM ID #: 39471

THE OVERALL OBJECTIVES OF PHASE I ARE TO DEVELOP FEASIBLE, EFFECTIVE SYSTEM CONCEPTS FOR UTILIZING SPACE-BASED ASSETS AS PLATFORMS FOR RF DECEPTION EQUIPMENT IN SUPPORT OF THE BATTLEFIELD COMMANER. THIS PHASE WILL RESULT IN THE DEVELOPMENT OF SPECIFIC SYSTEM DESIGNS WHICH IMPLEMENT THE CONCEPTS DEEMED EFFECTIVE. THE STUDY WILL FOCUS ON DEFINING THE SUITABILITY OF SPACE ASSETS TO THE FOLLOWING USES: SIMULATION OF BLUE (US/NATO) RADAR SIGNALS; SIMULATION OF BLUE COMMUNICATIONS SIGNALS; SIMULATION OF RED COMMUNICATIONS SIGNALS; GENERATION OF FALSE RADAR TARGET RETURNS. EACH OF THESE USES SERVES ONE OR MORE OF THE FOLLOWING FUNCTIONS: CONFUSION OF THE ENEMY'S TACTICAL SITUATION ASSESSMENT; OVERLOAD OF ENEMY SENSOR SYSTEMS; DILUTION OF HOSTILE LETHAL ASSETS; CREATION OF TACTICAL OPPORTUNITIES. THE PROPOSED APPROACH IS TO EMPLOY COMMERCIAL OFF-THE-SHELF (COTS) EQUIPMENT AND PROVEN TECHNOLOGIES TO PROVIDE A BASELINE DEMONSTRATION SYSTEM. PHASE II WILL FOCUS ON THE DEMONSTRATION OF THE KEY FUNCTIONALITIES IDENTIFIED IN PHASE I.

SYNETICS CORP
540 EDGEWATER DR
WAKEFIELD, MA 01880
Program Manager: D S BARGABUS
Contract #:
Title: AUTOMATIC SPEECH RECOGNITION FOR CONTROL OF UNIX-BASED C2 APPLICATIONS
Topic #: A90-024 Office: CECOM ID #: 39472

THE U.S. ARMY HAS A REQUIREMENT FOR A UNIX SHELL WHICH WOULD ALLOW A USER TO VERBALLY COMMUNICATE WITH A VARIETY OF COMMAND AND CONTROL APPLICATIONS. SUCH A SYSTEM WOULD, WITH MINIMAL EFFORT, REPLACE CONVENTIONAL I/O DEVICES. THE OBJECTIVE OF THE PHASE I EFFORT IS TO DEVELOP A UNIX/AUTOMATED SPEECH RECOGNITION (ASR) SHELL THAT MECHANIZES A GENERIC C2 MAN-MACHINE INTERFACE (MMI) VIA A LIMITED SET OF PRIMITIVES, AND DEMONSTRATE THE UTILITY OF THE SHELL BY IMPLEMENTING A TYPICAL C2 MMI VIA A COMBINATION OF THESE PRIMITIVES. THE UNIX SHELL WILL BE BASED ON PRIMITIVES THAT WOULD BE SUITED TO ANY C2 APPLICATION. THE OVERALL APPROACH WILL BE DIRECTED TOWARD A SYSTEM THAT IS BOTH FLEXIBLE AND ADAPTABLE TO NEW C2 APPLICATIONS.

GENISYS RESEARCH & DEVELOPMENT
201 MILL ST
ROME, NY 13440
Program Manager: JOSEPH C BREDA
Contract #:
Title: INNOVATIVE TECHNIQUES FOR OVERCOMING COCHANNEL INTERFERENCE IN HF MODEMS
Topic #: A90-025 Office: CECOM ID #: 39473

CO-CHANNEL INTERFERENCE REMAINS A PERSISTENT AND PERVASIVE ANNOYANCE FOR MOST HF BAND

COMMUNICATIONS. THE MULTIRATE ORTHOGONAL SAMPLING (MOS) TECHNIQUE PRESENTED IS AN INNOVATIVE, YET INTUITIVELY STRAIGHT- FORWARD APPROACH TO THE PROBLEM OF CO-CHANNEL INTERFERENCE. THE PREMISE OF THE MOS TECHNIQUE RELIES ON TWO FUNDAMENTAL PROPERTIES OF COMMUNICATION SIGNALS: (1) THE SIGNALS ARE CARRIER-BORNE I.E. THE INFORMATION SIGNAL HAS BEEN MODULATED ON TO A HIGH FREQUENCY CARRIER, AND (2) THE BANDWIDTH OF THE INFORMATION SIGNAL IS SIGNIFICANTLY LESS THAN CARRIER FREQUENCY. MOS DIVERGES FROM CONVENTIONAL DEMODULATION/ SUPPRESSION METHODS BY RECASTING THE PROBLEM TO ONE INVOLVING MULTIPLE WAVEFORM ESTIMATION. MOS DERIVES A SOLUTION BY CONSIDERING THE DEMODULATION/SUPPRESSION SIMULTANEOUSLY AS ONE OPTIMAL PARAMETER ESTIMATION PROBLEM. FOR TWO INTERFERING SINUSOIDS, THE BEST ESTIMATE OF ONE WAVEFORM IS OBTAINED WHEN THE COMPOSITE WAVEFORM IS SAMPLED AT A ZERO-CROSSING OF THE OTHER. MOS IS CONVENIENTLY IMPLEMENTED AS A SET OF MULTI-RATE SAMPLERS THAT COOPERATIVELY DEVELOP OPTIMAL SAMPLE CLOCKS TO PROVIDE INTERFERENCE SUPPRESSED ESTIMATES. MOS IS ESILY IMPLEMENTED USING INEXPENSIVE COMPONENTS, EASILY INTEGRATED INTO EXISTING HF MODEMS, AND DOESN'T REQUIRE COMPLEX ANTENNAS OR DEMODULATION CIRCUITRY.

PACIFIC-SIERRA RESEARCH CORP
1401 WILSON BLVD - STE 1100
ARLINGTON, VA 22209
Program Manager: TODD JAMISON
Contract #:
Title: ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL
Topic #: A90-026 Office: CECOM ID #: 39474

THIS PROPOSAL IS A PLAN FOR A PROOF OF CONCEPT DEMONSTRATION OF AN ARTIFICIAL INTELLIGENCE-BASED DECISION AID TO INTEGRATE PLANNING AND ANALYSIS OF AIR DEFENSE NETWORKS ON A SINGLE WORKSTATION. PROCEDURES FOR PLANNING AND ANALYZING AN AIR DEFENSE NETWORK ARE TIME AND LABOR INTENSIVE. THESE PROCEDURES CONSTITUTE ONE OF THE MOST DIFFICULT ASPECTS OF OPERATIONAL PLANNING BECAUSE OF TRANSITORY AIRSPACE EVENTS. THE PROPOSED SYSTEM INTEGRATES DECISION MAKING SUPPORT ROUTINES, HIGH-RESOLUTION TERRAIN AND FEATURE DATABASES WEAPONS SYSTEM CONSTRAINTS AND CAPABILITIES, AND DEPLOYMENT DOCTRINES WITH ADVANCED COMPUTING TECHNOLOGIES TO DRAMATICALLY REDUCE THE OPERATIONAL ANALYSIS, SITUATION ASSESSMENT, AND DECISION MAKING CYCLE. THE SYSTEM WILL DEVELOP DECISION SUPPORT TEMPLATES FOR AIR DEFENSE COMMAND AND CONTROL ORGANS THROUGH A LAYERED REASONING PROCESS. RULE-DRIVEN GRAPHICAL ALGORITHMS WILL BE APPLIED TO PROVIDE FAST AND INTELLIGENT AUTOMATED SITE SELECTION AND EVALUATION PROCESSES. PATHFINDING AND GRAPHICAL/REGION GROWING ALGORITHMS WILL EVALUATE INTERSITE ROUTES. POSSIBLE TECHNIQUES FOR OPTIMIZING SITE COMBINATIONS INTO AIR DEFENSE NETWORKS INCLUDE DIRECTED SEARCH, TREE-PRUMING ALGORITHMS, RELAXATION TECHNIQUES, AND ARTIFICIAL NEURAL NETWORKS.

SPECTRUM MANAGEMENT GP INC
3211 JERMANTOWN RD - STE 401
FAIRFAX, VA 22030
Program Manager: DR NICHOLAS LAWRENCE
Contract #:
Title: MULTI SENSOR AUTOMATIC TEMPLATE GENERATION WITH CORRELITHMS
Topic #: A90-027 Office: CECOM ID #: 39475

OUR FIRM GAINED EXPERIENCE IN CHARACTERIZING AND CLASSIFYING SENSOR DATA WITH TEMPLATES IN RECENT SBIR PROJECTS. THE TECHNOLOGY WE DEMONSTRATED APEARS TO US TO BE ADAPTABLE TO THIS TOPIC. WE BELIEVE THAT OUR TECHNOLOGY IS SUPERIOR TO OTHER AVAILABLE TECHNIQUES FOR ABSTRACTING AND TEMPLATING DATA. WE PROPOSE TO FIND OUT. WE WILL SURVEY THE LITERATURE

TO IDENTIFY APPROPRIATE COMPETITION, THEN DEVELOP AND CODE COMPETITIVE DEMONSTRATIONS TO SELECT THE BEST OPTION.

LNR COMMUNICATIONS INC
180 MARCUS BLVD
HAUPPAUGE, NY 11788
Program Manager: FRED RICHTER
Contract #:
Title: MODULATION BASED PULSE ASSOCIATION TECHNIQUES
Topic #: A90-028 Office: CECOM ID #: 39476

WITH THE PROLIFERATION OF RADARS THAT USE RAPIDLY VARYING TRANSMITTED PULSE PARAMETERS TO AVOID DETECTION AND RECOGNITION, UNINTENTIONAL MODULATION ON SAID PULSES MAY BECOME A PRIMARY RECEIVED SIGNAL SORT PARAMETER, E.G. A MENS OF ASSOCIATING THE INTERCEPTED PULSE TRAIN WITH A "KNOWN" EMITTER. USE OF UNINTENTIONAL MODULATION ON PULSES (UMOP) AS A SORT PARAMETER CAN PROVIDE BETTER SIGNAL RECOGNITION AND BETTER PARAMETER MEASUREMENTS AND LOCATION COMPUTATIONS THROUGH GENERATION OF MORE VALID ASSOCIATIONS WITH "KNOWN" EMITTER PULSE TRAINS AND, THEREFORE BETTER RECOGNITION OF INTERCEPTED SIGNALS. ACCORDINGLY, A PHASE I STUDY IS PROPOSED TO INVESTIGATE THREE APPROACHES TO THE MEASUREMENT AND CHARACTERIZATION OF UMOP, EACH ENTAILING THE GENERATION OF DIGITIZED DESCRIPTIONS OF INTERCEPTED PULSED SIGNALS FOR COMPARISON AGAINST DIGITAL DESCRIPTORS STORED IN A SIGNAL LIBRARY. THESE THREE APPROACHES INCLUDE: FOURIER FREQUENCY SPECTRAL ANALYSIS, PULSE SHAPE, AND PULSE SHAPE IN COMBINATION WITH FM DETECTOR RESPONSE. SPECIAL EMPHASIS WILL BE APPLIED TO THE PROBLEMS OF UMOP DISTORTION FROM SIMULTANEOUS PULSE RECEPTION AND MULTIPATH RECEPTION. SAMPLING RATES, TIME, FREQUENCY, AND AMPLITUDE QUANTIZATION STEPS NECESSARY FOR THE THREE APPROACHES WILL BE ANALYZED AND RECOMMENDATIONS MADE ON THE BEST COMPROMISE OF RESULTS, COST, COMPLEXITY, AND DESIGN RISK WITH A BLOCK DIAGRAM AND SPECIFICATION FOR THE RECOMMENDED APPROACH TO A UMOP PULSE-ASSOCIATED POST RECEIVER.

F&H APPLIED SCIENCE ASSOCS
7105 GREENE ST
PHILADELPHIA, PA 19119
Program Manager: R P HERCZFELD
Contract #:
Title: FIBEROPTIC REMOTE ANTENNA SYSTEM
Topic #: A90-029 Office: CECOM ID #: 39477

THE PROPOSED PROJECT IS CONCERNED WITH THE DEVELOPMENT OF HIGH PERFORMANCE FIBEROPTIC LINKS FOR ANTENNA REMOTING. EMPHASIS IS ON THE BANDWIDTH, DYNAMIC RANGE, AND RELIABILITY OF THE SYSTEM. THE INTERFACE BETWEEN THE MICROWAVE AND PHOTONIC COMPONENTS IS ADDRESSED.

LAB-TEK CORP
8 LUNAR DR
WOODBRIDGE, CT 06525
Program Manager: THOMAS E GRIEST
Contract #:
Title: DISTRIBUTED ADA REAL-TIME SOFTWARE: DEVELOPMENT AND EXECUTION SUPPORT
Topic #: A90-030 Office: CECOM ID #: 39478

THIS PROPOSAL DESCRIBES THE INVESTIGATION OF TECHNIQUES TO ACHIEVE EFFICIENT AND RELIABLE

DISTRIBUTED PROCESSING USING THE ADA PROGRAMMING LANGUAGE AND SPECIFYING PARALLELISM BY UTILIZING THE ADA TASK MODEL. THE INTENT IS TO SUPPORT TRANSPARENT DISTRIBUTION WHICH WILL ALLOW SOFTWARE FUNCTIONALITY TO MIGRATE AMONG PROCESSORS WITHIN A LOCAL AREA NETWORK TO ACHIEVE PERFORMANCE AND FAULT TOLERANCE REQUIREMENTS. AREAS OF PARTICULAR CONCERN WHICH WILL BE ADDRESSED ARE: THE WAY IN WHICH TASKS AND DATA RE ASSOCIATED WITH PROCESSORS; A CONFIGURABLE NETWORK INTERFACE WHICH CAN SUPPORT THE REQUIREMENTS OF THE ADA RUNTIME; ND ACCESS TO SHARED DATA AMONG DISTRIBUTED TASKS. ALSO ADDRESSED ARE TOOLS TO SUPPORT DEBUGGING DISTRIBUTED SYSTEMS AS WELL AS TO MONITOR THE PERFORMANCE AND ASSIST IN PREDICTION OF OVERLOAD CONDITIONS.

TEC-MASTERS INC
410 JORDAN LN
HUNTSVILLE, AL 35805
Program Manager: JAMES F MILLER
Contract #:
Title: REQUIREMENTS ENGINEERING METHODOLOGY AND TECHNIQUES
Topic #: A90-031 Office: CECOM ID #: 39479

A NEW APPROACH TO SOFTWARE SPECIFICATION ANALYSIS WHEREBY THE MODIFICATIONS ARE ANNOTATED USING ALGORITHMS WHICH AUTOMATE THE PROCESS OF IDENTIFYING CHANGES. THE AUTOMATED SYSTEM WOULD SYNTACTICALLY ANALYZE EACH SENTENCE FOR CHANGES. A GRAPHICS MANAGER WOULD THEN PRODUCE THE CORRECT CHANGE BAR ANNOTATION WHICH IS INDEXED TO THE CORRESPONDING SENTENCE. THE CHANGE BARS WILL IDENTIFY UP TO TEN LEVELS OF REVISIONS AND ADDITIONS OR DELETIONS. ERRATA SHEETS WILL THEN BE GENERATED BASED UPON ACTUAL SPECIFICATION CHANGES RATHER THAN CHANGE REQUESTS OR OTHER GENERATING DOCUMENTS WHICH MAY BE INCOMPLETE.

SOFTWARE COMPOSITIONS
PO BOX 510477
MELBOURNE BEACH, FL 32951
Program Manager: KATHLEEN GILROY
Contract #:
Title: PREVENTIVE MAINTENANCE TOOLS AND TECHNIQUES FOR ADA SOFTWARE REUSE
Topic #: A90-032 Office: CECOM ID #: 39480

THIS EFFORT IS ADDRESSING THE APPLICATION OF PREVENTIVE MAINTENANCE TECHNIQUES AND REVERSE/RE-ENGINEERING TOOLS TO EXISTING ADA SOFTWARE FOR THE CREATION AND USAGE OF REUSABLE COMPONENTS. TECHNICAL OBJECTIVES FOR THE PHASE I EFFORT ARE: 1) DESCRIBE THE RELATIONSHIPS BETWEEN THE SOFTWARE MAINTENANCE AND THE SOFTWARE DEVELOPMENT AND REUSE PROCESSES. SPECIFICALLY, ILLUSTRATE THE POTENTIAL ROLES OF PREVENTIVE MAINTENANCE OF EXISTING SYSTEMS FOR ACHIEVING SOFTWARE REUSE. 2) SHOW HOW VARIOUS MAINTENANCE TOOLS AND TECHNIQUES CAN BE APPLIED TO MAKE EXISTING SOFTWARE MORE REUSABLE. IDENTIFY EXISTING AUTOMATED CAPABILITIES, AND EMERGING TECHNIQUES. POSTUALTE AN IDEAL SUPPORT ENVIRONMENT. 3) IDENTIFY AND ASSESS POTENTIAL COST/BENEFIT TRADE-OFFS, AND OUTSTANDING ISSUES AND RISKS, ASSOCIATED WITH THE PREVENTIVE MAINTENANCE APPROACH. 4) DEFINE A SUITABLE SEMI-AUTOMATED CAPABILITY THAT COULD BE PROTOTYPED IN PHASE II, WITH A GOAL OF COMMERCIALIZATION IN PHASE III. 5) DEMONSTRATE THE FEASIBILITY AND USEFULNESS OF THE APPROACH BY IMPLEMENTING A SUBSET OF THE RECOMMENDED TOOLS AND METHODS. THE PROPOSED SUBSET INCLUDES AN ADA PARAMETERIZER AND COMPLEMENTARY ADA ADAPTOR.

ASTRON CORP
470 SPRING PARK PL - #100

HERNDON, VA 22070
Program Manager: JOSEPH R JAHODA
Contract #:
Title: ELECTRONIC WARFARE HF ANTENNA SIZE REDUCTION
Topic #: A90-033 Office: CECOM ID #: 39481

THERE IS A MAJOR ARMY REQUIREMENT FOR REDUCING THE PHYSICAL SIZE OF TACTICAL HF ANTENNAS (FOR USE ON A VARIETY OF CARRIERS FROM TRACKED VEHICLES TO DRONES) FOR ELECTRONIC WARFARE APPLICATIONS WITHOUT DEGRADING CURRENTLY ACCEPTED PERFORMANCE AND STILL MAINTAINING THE SAME GAIN, FREQUENCY AND POWER HANDLING CAPABILITIES. THE APPROACHES WHICH ARE POTENTIALLY CAPABLE OF ACHIEVING THIS ARE: SUPERCON- DUCTIVITY; AND DIELECTRIC/FERRITE LOADING.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: CARLES A CAREY
Contract #:
Title: HTSC SMALL ANTENNA AND MATCHING NETWORK
Topic #: A90-033 Office: CECOM ID #: 40636

THE APPLICATION OF SUPERCONDUCTIVITY TO THE REDUCTION OF HF MONOPOLE ANTENNAS IS INVESTIGATED. AN INNOVATIVE DESIGN IS PROPOSED WHICH CANNOT BE IMPLEMENTED IN COPPER BECAUSE OF LOSSES. THE DESIGN CONSISTS OF 0.005 WAVELENGTH (10 cm AT 15 MHz) MONOPOLE MATCHED WITH A UNIQUE SLOW WAVE DELAY LINE. ALSO INCLUDED IN THE EFFORT IS THE APPLICATION OF ELECTROPHORETIC FILMS WHICH ARE MAGNETICALLY ALIGNED TO PRODUCE IMPROVED CRITICAL CURRENT AND REDUCED SURFACE RESISTANCE LARGE SCALE (UNDER OF 10 cm) AND COMPLEX (COILS) SUPERCONDUCING OBJECTS. THIS INNOVATIVE MATERIALS APPROACH MAY PRODUCE TWO ORDERS OF MAGNITUDE IMPROVEMENT OF Jc AND Rs.

ALABAMA CRYOGENIC ENGINEERING INC
PO BOX 2470
HUNTSVILLE, AL 35804
Program Manager: JOHN B HENDRICKS
Contract #:
Title: AIR COOLED HIGH HEAT FLUX THERMAL PACKAGE
Topic #: A90-034 Office: CECOM ID #: 39482

CONTINUOUS, FULL POWER OPERATION OF HIGH OUTPUT SEMICONDUCTOR DEVICES IS GENERALLY LIMITED BY THE HEAT DISSIPATION CAPABILITY OF THE DEVICE PACKAGE. EXISTING COOLING SCHEMES REQUIRE COOLING PUMPS AND SECONDARY RADIATORS, WHICH LIMITS THE APPLICATION OF THESE DEVICES TO LARGE VEHICLES. THIS PROPOSAL CONCERNS THE ANALYSIS AND DESIGN OF A THERMAL PACKAGE WHICH IS CAPABLE OF DISSIPATING HIGH HEAT FLUX LOADS, WITH NO COOLING PUMPS, AND IS COMPACT. A COMBINATION OF A HIGH HEAT FLUX HEAT SINK, HEAT PIPE AND SECONDARY AIR COOLED HEAT EXCHANGER COMPRISE THE THERMAL PACKAGE. CRUCIAL TO THE OVERALL PERFORMANCE, THE HEAT SINK, IS FABRICATED BY A PROPRIETARY PROCESS THAT ALLOWS SUBSTANTIAL FLEXIBILITY IN THERMAL DESIGN. PREVIOUS LIMITS ON HEAT SINK PERFORMANCE DUE TO MANUFACTURING CONSTRAINTS ARE DRAMATICALLY REDUCED. A HEAT PIPE TRANSPORTS THE DISSIPATED HEAT, ELIMINATING COOLING PUMPS, TO THE SECONDARY AIR COOLED HEAT EXCHANGER. THIS PROPOSED EFFORT CONCERNS THE ANALYSIS AND DESIGN OF EACH COMPONENT AND A SYSTEMS ANALYSIS. THE PHASE II EFFORT WILL ENTAIL BUILDING AND TESTING A PROTOTYPE UNIT.

CRYSTALLUME
125 CONSTITUTION DR
MENLO PARK, CA 94025
Program Manager: WILSON SMART
Contract #:
Title: DIAMOND HEAT PUPES FOR EFFICIENT COOLING OF HIGH POWER DENSITY DEVICES
Topic #: A90-034 Office: CECOM ID #: 40652

THE OVERALL OBJECTIVE OF THIS RESEARCH IS TO DEMONSTRATE THAT CVD DIAMOND FILMS CAN BE INCORPORATED INTO HEAT PIPER DESIGNS SUCH THAT THE RESULTING THERMAL IMPEDANCE IS SIGNIFICANTLY LOWER THAN THAT OF THE CURRENT TECHNOLOGY. TO ACHIEVE THIS, THE EXISTING HEAT PIPE TECHNOLOGY WILL BE REVIEWED AND ANALYZED. IN PARTICULAR, THE KEY SPECIFICATIONS, REQUIREMENTS AND/OR LIMITATIONS WILL BE IDENTIFIED AND A MATHEMATICAL MODEL WILL BE USED TO CHARACTERIZE THE THERMAL PROPERTIES OF HEAT PIPES. USING THIS INFORMATION, HYPOTHETICAL MODELS OF DIAMOND BASED HEAT PIPES WILL BE DEVELOPED AND ANALYZED. THE MATHEMATICAL MODEL USED FOR THERMAL ANALYSIS OF THE STANDARD TECHNOLOGY WILL ALSO BE USED TO DETERMINE THE IMPROVEMENTS TO BE EXPECTED FROM DIAMOND. TO DEMONSTRATE THE FEASIBILITY OF USING DIAMOND IN THIS APPLICATION, A SIMPLE PROTOTYPE OF DIAMOND BASED HEAT PIPE WILL BE FABRICATED. THE DIAMOND WILL BE CHARACTERIZED FOR ITS THERMAL AND MECHANICAL PROPERTIES.

DIGITAL RADIO CORP
601 S PACIFIC COAST HWY
REDONDO BEACH, CA 90277
Program Manager: OLIVER SAUNDERS
Contract #:
Title: DIRECTIVE RADIATING EXPENDABLE JAMMER
Topic #: A90-035 Office: CECOM ID #: 39483

THIS PROPOSAL DESCRIBES AN EFFORT TO DESIGN AN EXPENDABLE JAMMER WHICH CAN DIRECT ITS ENERGY IN A DIRECTION WHICH HAS EITHER BEEN PRE-PROGRAMMED INTO IT OR HAS BEEN COMMANDED OVER SOME FORM OF CONTROL LINK. USING CHEAP, SIMPLE, NON-MECHANICAL DIRECTION FINDING SENSORS, IT IS POSSIBLE FOR THE JAMMER TO RAPIDLY DETERMINE THE ORIENTATION OF ITS ANTENNA ARRAY RELATIVE TO THE COMMAND DIRECTION OF RADIATION. THE MAJOR TECHNICAL CHALLENGE IN THIS PROGRAM IS TO IDENTIFY AN ANTENNA CONFIGURATION WHICH IS PHYSICALLY SMALL AND ALSO MEETS THE SEVERE CONSTRAINTS WHICH ARE NECESSARILY PART OF AN EXPENDABLE DESIGN. THE IDEAL ANTENNA ARRAY WOULD BE SMALL, OPERATE OVER A WIDE FREQUENCY BANDWIDTH, HAVE A DIRECTIVE RADIATION PATTERN AND THE BEAM WOULD BE STEERABLE OVER 360 DEGREES IN AZIMUTH. REALISTICALLY, AN ANTENNA ARRAY FOR THIS APPLICATION WOULD CONSIST OF A SET OF VERTICAL MONOPOLES OR DIPOLES, INCLUDING AN IMPEDANCE MATCHING NETWORK, APPROPROATELY PHASED TO FORM A CARDIOID OR SLIGHTLY DIRECTIONAL RADIATION PATTERN. THE NUMBER OF ELEMENTS IN THE ARRAY MUST BE KEPT TO A MINIMUM BECAUSE OF PROBABLE SIZE RESTRICTIONS. TYPICALLY, A FOUR ELEMENT ARRAY ARRANGED IN A SQUARE WOULD BE USED ALTHOUGH A THREE ELEMENT ARRAY ARRANGED IN AN EQUILATERAL TRIANGLE IS A POSSIBLE ALTERNATIVE.

INFORMATION SYSTEMS LABS INC
8130 BOONE BLVD - STE 500
VIENNA, VA 22182
Program Manager: JOHN E DON CARLOS
Contract #:
Title: ANALYSIS AND EVALUATION OF ADVANCED DIRECTION FINDING (DF) APPROACHES
Topic #: A90-036 Office: CECOM ID #: 39484

HIGH FREQUENCY (HF) RADIO HAS HISTORICALLY BEEN AND WILL CONTINUE TO BE A VITAL MEDIUM FOR COMMUNICATIONS CAPABLE OF OPERATION WITHOUT RELAY TO OVER-THE-HORIZON DISTANCES USING RELATIVELY INEXPENSIVE EQUIPMENT. LOCATION AND TRACKING OF COMMUNICATION SIGNALS CAN PROVIDE A VALUABLE SOURCE OF EXTRACT ANGLE OF ARRIVAL INFORMATION IN THE PRESENCE OF SEVERE IONOSPHERIC PROPAGATION EFFECTS. WE PROPOSE TO DEVELOP AN INTERACTIE SCIENTIFIC WORKSTATION INCORPORATING MULTIPLE SIGNAL PROCESSORS TO EVALUATE SUCH ADVANCED TECHNIQUES.

EXPERSOFT
6160 CORNERSTONE CT EAST
SAN DIEGO, CA 92121
Program Manager: DR RUBIN JOHNSON
Contract #:
Title: ASSUMPTION TRUTH MAINTENANCE IN AUTOMATIC TARGET RECOGNITION (ATR) ALGORITHM DESIGN
Topic #: A90-037 Office: CECOM ID #: 39485

THE USE OF COMPUTER PROCESSING TO DETECT AND IDENTIFY TARGETS IS BECOMING CRITICALLY IMPORTANT IN SEVERAL MILITARY APPLICATIONS. WE PRESENT CANDIDATE ALGORITHMS THAT IMPLEMENT MULTISOURCE INFORMATION INTEGRATION WITH TRUTH MAINTENANCE AND UNCERTAINTY REPRESENTATION. THESE ALGORITHMS WILL ALLOW NON-MONOTONIC LOGIC AND PROBABILISTIC REASONING. GRAPHICAL SOFTWARE TOOLS ARE DEVELOPED TO DEMONSTRATE THE EFFICACY AND LOGIC OF THE ALGORITHMS. THE TEAM ASSEMBLED FOR THIS TASK HAS PRACTICAL EXPERIENCE WITH THE SOLUTION OF SIMILAR PROBLEMS IN SMART WEAPON APPLICATIONS AS WELL AS THEORETICAL AND PRACTICAL KNOWLEDGE OF THE MATHEMATICS AND ALGORITHMS OF SENSOR FUSION AND EVIDENCE ACCUMULATION.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
Program Manager: DR HORACIO R VERDUN
Contract #:
Title: NEW CHROMIUM-ACTIVATED CRYSTALS FOR DIODE-PUMPED LASERS OPERATING IN THE NEAR INFRARED
Topic #: A90-038 Office: CECOM ID #: 39486

THE RECENT DEVELOPMENT OF HIGH-POWER GaAlAs DIODE LASER ARRAYS EMITTING IN THE 740-890 um REGION ENCOURAGES THE SEARCH FOR NEW CHROMIUM-DOPED CRYSTALS FOR NEAR-INFRARED TUNABLE LASERS WITH POTENTIAL FOR IMPROVED PERFORMANCE. AMONG THE MANY CRYSTAL HOSTS, THERE ARE THOSE WITH STRUCTURE POSSESSING DISTORTED OCTAHEDRAL SITES WITH APPROPRIATE SYMMETRIES FOR THE PRODUCTION OF LEVEL SPLITTING AND LARGE ELECTRIC DIPOLE OSCILLATOR STRENGTHS REQUIRED FOR THE EFFICIENT OPERATION OF THESE LASERS. IT IS PROPOSED HERE TO CONDUCT THE DEVELOPMENT OF THE GROWTH CONDITIONS AND THE OPTIMIZATION OF THE DOPANT CONCENTRATION FOR CHROMIUM-DOPED CRYSTALS OF UNIQUE STRUCTURE AND COMPOSITION IN ORDER TO ACHIEVE EFFICIENT ROOM- TEMPERATURE TUNABLE LASER OPERATION IN THE NEAR INFRARED UNDER DIODE-LASER PUMPING.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERCIA, MA 01821
Program Manager: ANDREW FREEDMAN
Contract #:
Title: PATTERNED ETCHING OF INFRARED DETECTOR ARRAYS

Topic #: A90-039 Office: CECOM ID #: 39487

WE PROPOSE TO DEVELOP A PATTERNED ETCHING TECHNIQUE FOR INFRARED DETECTOR ARRAYS BASED ON PHOTO-INDUCED ETCHING OF HgCdTe THAT IS COMPATIBLE WITH THE ULTRA-HIGH VACUUM ENVIRONMENT OF A MOLECULAR BEAM EPITAXY APPARATUSES. THE PHASE I RESEARCH FOCUSES ON ESTABLISHING THE EFFICACY OF SUITABLE GAS PHASE PRECURSORS FOR THE ETCHING PROCESS. IF THE PHASE I RESEARCH IS SUCCESSFUL, OPTICAL PROJECTION TECHNIQUES WILL BE USED TO PRODUCE ARRAY STRUCTURES. SIMILAR TECHNIQUES MAY BE SUITABLE FOR MAKING OHMIC CONTACTS TO THE MESAS FORMED BY THE ETCHING STEP.

IMAGING & SENSING TECHNOLOGY CORP
WESTINGHOUSE CIR
HORSEHEADS, NY 14845
Program Manager: DR MARTIN GREEN
Contract #:
Title: INTEGRATED AUDIO-VISUAL HEADSET DISPLAY TERMINAL FOR MAINTENANCE PERSONNEL
Topic #: A90-040 Office: CECOM ID #: 39488

LOGISTICS AND MAINTENANCE INFORMATION STORED IN PC-BASED ADP/TMDE EQUIPMENT IS NOT READILY AVAILABLE TO PERSONNEL WORKING AWAY FROM THE SHOP BENCH. YET THE NEED FOR RAPID ACCESS TO COMPUTER BASED LOGISTICS INFORMATION WILL GROW AS THE CALS INITIATIVE PUTS PROGRESSIVELY MORE MAINTENANCE DATA INTO COMPUTER READABLE FORMATS. MAINTENANCE PERSONNEL AWAY FROM THE REPAIR SHOP BENCH CAN ALSO FACE A CRAMPED AND CONFINING WORK ENVIRONMENT. THE IAVHDT WILL ADDRESS THESE TWO ISSUES BY PROVIDING REMOTE, HANDS-FREE ACCESS TO THE REQUIRED INFORMATION THROUGH A COMPACT, LIGHTWEIGHT HEADSET. IMAGING AND SENSING TECHNOLOGY CORPORATION, WITH COMPUTER SOFTWARE, ELECTRONIC DESIGN AND SPECIAL HEADSET DISPLAY EXPERTISE, ASSISTED BY ITS SUBCONTRACTOR, WESTINGHOUSE, WITH MANY YEARS OF EXPERIENCE IN COMPUTER AIDED MAINTENANCE SYSTEMS, HAS THE SKILLS NEEDED FOR ALL PHASES OF THE IAVHDT PROJECT. WE HAVE IDENTIFIED THE COMMUNICATIN LINK, THE DISPLAY AND THE VOICE RECOGNITION UNIT AS CRITICAL SUBSYSTEMS, ND A NUMBER OF THE OFF-THE-SHELF COMPONENTS HAVE BEEN RECOMMENDED FOR FURTHER STUDY. IN ADDITION TO MILITARY USES FOR THE IAVHDT, ISTC HAS LOCATED A NUMBER OF MEDICAL AND INDUSTRIAL APPLICATIONS WHICH SUGGEST THAT COMMERCILIZATION COULD BE A RAPID PROCESS.

SOFTWARE CONSULTANTS INTERNATIONAL LTD
13812 SE 240TH ST
KENT, WA 98042
Program Manager: LAWRENCE PETERS
Contract #:
Title: PROCESS IMPROVEMENT TOOL FOR SOFTWARE DEVELOPMENT
Topic #: A90-041 Office: CECOM ID #: 39489

ATOOL IS PROPOSED WHICH WILL IMPROVE THE EFFICIENCY AND EFFECTIVENESS OF THE DEFECT AND ERROR CORRECTION CAPABILITY OF SOFTWARE DEVELOPERS. THIS TOOL WILL INCORPORATE SEVERAL OF THE LATEST CONCEPTS IN SOFTWARE ENGINEERING INCLUDING OBJECT ORIENTED ANALYSIS, EXPERT SYSTEMS AND CASE ENVIRONMENTS. THIS PHASE I EFFORT IS DIRECTED AT IDENTIFYING WHAT DATA, PARAMETERS, AND RELATIONSHIPS MUST BE IDENTIFIED DURING DEVELOPMENT, WHICH WILL PROVIDE THE MOST BENEFIT TO SUPPORT OBJECTIVES STATED ABOVE, ND TO SUBSET THESE INTO AUTOMATIBLE FUNCTIONS. THIS EFFORT INCLUDES THE CREATION OF A STRUCTURED ANALYSIS MODEL TO SUPPORT THE DEVELOPMENT OF A PHASE II COMMERCIAL PRODUCT. THE CAPABILITIES ENVISIONED FOR THIS EFFORT AND SUBSEQUENT PHASE II ARE NOT AVAILABLE IN CURRENT CASE TOOLS. A BY-PRODUCT OF THIS EFFORT WILL BE TO IDENTIFY INTERFACES WITH OTHER CASE PRODUCTS.

SRS TECHNOLOGIES
990 EXPLORER BLVD
HUNTSVILLE, AL 35806
Program Manager: MICHAEL A SCHROER
Contract #:
Title: PROCESS IMPROVEMENT TOOL FOR SOFTWARE DEVELOPMENT
Topic #: A90-041 Office: CECOM ID #: 39490

THE OBJECTIVE OF THIS EFFORT IS TO EXPLORE THE FEASIBILITY OF DEVELOPING AN ADVANCED COMPUTER-BASED TOOL THAT WILL ENHANCE GOVERNMENT AND CONTRACTOR CONTROL OF THE SOFTWARE DEVELOPMENT PROCESS. THIS TOOL WILL ENHANCE THE DEVELOPMENT OF QUALITY SOFTWARE THROUGH THE USE OF CLEAR CONTRACTURAL DEFINITION OF QUALITY MEASURES AND THE USE OF SOFTWARE TOOLS TO MEASURE SOFTWARE QUALITY. THE TOOL WILL COVER THE ENTIRE SOFTWARE LIFECYCLE FROM REQUIREMENTS DEFINITION THROUGH ACCEPTANCE TESTING.

CHARLES RIVER ANALYTICS INC
55 WHEELER ST
CAMBRIDGE, MA 02138
Program Manager: DR ALPER K CAGLAYAN
Contract #:
Title: A PRACTICAL APPROACH TO HIGH AVAILABILITY TACTICAL SYSTEM SOFTWARE
Topic #: A90-043 Office: CECOM ID #: 39491

SINCE SOFTWARE IS A CRUCIAL COMPONENT OF TACTICAL SYSTEMS, THE RELIABILITY AND AVAILABILITY OF TACTICAL SYSTEM SOFTWARE IS CRITICAL IN THE FIELD. IN IMPROVING SOFTWARE RELIABILITY, THE USE OF FORMAL SOFTWARE ENGINEERING METHODOLOGIES AND THE USE OF ADA WHICH SUPPORTS AND ENFORCES MODERN SOFTWARE ENGINEERING PRINCIPLES HAVE YIELDED SIGNIFICANT PROGRESS. IN CONTRAST, SIMILAR PROGRESS HAS NOT BEEN MADE IN IMPROVING TACTICAL SYSTEM SOFTWARE AVAILABILITY, I.E., TOLERANCE TO AND RECOVERY FROM SOFTWARE FAULTS. WHAT IS NEEDED FOR TACTICAL SYSTEM SOFTWARE IS TO ADAPT THE FAULT DETECTION AND RECOVERY TECHNIQUES FROM SOFTWARE FAULT TOLERANCE THEORY TO AN ADA SOFTWARE ENVIRONMENT. HERE, WE PROPOSE TO INVESTIGATE PRACTICAL TECHNIQUES FROM SOFTWARE FAULT TOLERANCE THEORY IN ORDER TO INCREASE THE AVAILABILITY OF TACTICAL SYSTEM SOFTWARE, TO DETERMINE THE FEASIBILITY OF INCORPORATING THESE TECHNIQUES INTO AN ADA BASED SOFTWARE ENGINEERING METHODOLOGY, AND TO DEVELOP A SPECIFICATION FOR A SOFTWARE DEVELOPMENT TOOL FOR IMPLEMENTING THESE TECHNIQUES.

SO-HA-R INC
1040 S LA JOLLA AVE
LOS ANGELES, CA 90035
Program Manager: DR HERBERT HECHT
Contract #:
Title: PRACTICABLE SOFTWARE FAULT TOLERANCE
Topic #: A90-043 Office: CECOM ID #: 39492

A METHODOLOGY IS PROPOSED FOR TARGETING SPECIFIC ERROR DETECTION AND RECOVERY TECHNIQUES AT FREQUENT AND SEVERE CAUSES OF SOFTWARE FAILURES. THE SPECIFIC TECHNIQUES ARE MUCH LESS COSTLY TO IMPLEMENT THAN COMPREHENSIVE MULTI-VERSION APPROACHES THAT ARE WIDELY DESCRIBED IN THE TECHNICAL LITERATURE. A KEY ASSUMPTION IN OUR APPROACH IS THAT MOST FAILURES IN OPERATION TACTICAL SYSTEMS ARE DUE TO RARELY ENCOUNTERED DATASETS OR COMPUTER STATES, AND THAT NORMAL OPERATION CAN BE RESUMED IF THE RESULTS OF FAULTY OPERATIONS CAN BE CLEARED FROM THE SYSTEM. TO AID LESS EXPERIENCED PERSONNEL IN SELECTING AND PLACING THE FAULT TOLERANCE PROVISIONS, AN EXPERT SYSTEM WILL BE DEVELOPED.

PARTICLE TECHNOLOGY INC
PAINT BRANCH DR - BLDG 335
COLLEGE PARK, MD 20742
Program Manager: M B RANADE
Contract #:
Title: DEVICE FOR SORTING MICRON SIZE DIELECTRIC AND CONDUCTING POWDERS
Topic #: A90-045 Office: CRDEC ID #: 39493

A LABORATORY CLASSIFIER WILL BE DESIGNED AND FABRICATED TO CLASSIFY SEVERAL TEST POWDERS IN THE MICRON AND SUBMICRON SIZE RANGE AND REPRESENTING CONDUCTING AND DIELECTRIC MEDIA. THE CLASSIFIER WILL BE BASED ON AN INERTIAL AND ELECTRICAL SEPARATION AND SORTING OF PARTICLES ACCORDING TO PARTICLE SIZE. THE PERFORMANCE WILL BE DOCUMENTED USING TEST PARTICLES OF KNOWN SIZE CHARACTERISTICS AND BY MEASURING SIZE CHARACTERISTICS OF THE SORTED PARTICLES. DESIGN INFORMATION FOR THE PHASE II PROTOTYPE WILL BE DEVELOPED USING A PARAMETRIC TEST SEQUENCE.

SEVEN MOUNTAINS SCIENTIFIC INC
PO BOX 650
BOALSBURG, PA 16827
Program Manager: DR E THOMAS CHESWORTH
Contract #:
Title: SINGLE PARTICLE MULTIANALYSIS CHAMBER
Topic #: A90-046 Office: CRDEC ID #: 39494

SEVEN MOUNTAINS SCIENTIFIC INC. OF BOALSBURG, PENNSYLVANIA, PROPOSES A SIX MAN-MONTH LEVEL OF EFFORT, SIX-MONTH PERIOD OF PERFORMANCE PHASE I EFFORT TO DEVELOP DETAILED SPECIFICATIONS FOR AND PERFORM AN INITIAL DESIGN OF A SINGLE PARTICLE MULTIANALYSIS INSTRUMENT TO PERFORM DEFINITIVE CHEMICAL ANALYSES OF INDIVIDUAL AEROSOLS WITH LESS THAN 30 MICRON DIAMETERS. THE PARTICLES WILL BE SUSPENDED IN A CHAMBER WHERE A SEQUENCE OF NON-DESTRUCTIVE SPECTROSCOPIC ANALYSIS AND CHEMICAL INDICATOR TESTS WILL BE PERFORMED ON A SINGLE PARTICULATE.

TR&B JOINT VENTURE
1228 OLYMPUS DR
NAPERVILLE, IL 60540
Program Manager: DR JOSEPH R STETTER
Contract #:
Title: ATMOSPHERIC PRESSURE ION-MOLECULE CHEMISTRY IN ION MOBILITY SPECTROMETERS FOR INCREASED SENSITIVITY AND SPECIFICITY
Topic #: A90-047 Office: CRDEC ID #: 39495

A BACKGROUND STUDY WILL BE PERFORMED ON THE STATE-OF-THE-ART SPECIFIC MATERIALS AND ION PRODUCTION TECHNIQUES THAT CAN BE ADDED TO IMS SYSTEMS TO IMPROVE SENSITIVITY AND SPECIFICITY. ION-MOLECULE CHEMISTRY AND SIGNAL PROCESSING ALGORITHMS THAT WILL ALLOW INTERFERENCE REJECTION WILL BE INCLUDED.

SONOMA RESEARCH CO
PO BOX 116
VINEBURG, CA 95487

Program Manager: DR OLEH WERES
Contract #:
Title: DECONTAMINATION SYSTEM UTILIZING HYDROGEN PEROXIDE UV LIGHT AND CATALYTIC SURFACES
Topic #: A90-048 Office: CRDEC ID #: 39496

WE PROPOSE TO DEVELOP A PORTABLE SYSTEM FOR DECONTAMINATION OF VEHICLE INTERIORS WHICH WILL DEACTIVATE CHEMICAL AND BIOLOGICAL AGENTS RAPIDLY AND RELIABLY, IN A NONSELECTIVE MANNER, AND WITHOUT REQUIRING THAT THE IDENTITY OF THE CONTAMINATING AGENT BE KNOWN. HYDROGEN PEROXIDE WILL BE APPLIED TO ALL INTERIOR SURFACES, VISIBLE AND HIDDEN, AS A CONDENSING VAPOR OR AEROSOL. UV LIGHT (ON VISIBLE SURFACES) AND APPROPRIATE CATALYTIC SURFACE COATINGS (ON HIDDEN SURFACES) WILL CONVERT HYDROGEN PEROXIDE TO EXTREMELY REACTIVE HYDROXYL RADIAL, CAPABLE OF RAPIDLY DEGRADING ALL AGENTS. THE PROCESS WILL NOT DAMAGE EQUIPMENT, NOR LEAVE CORROSIVE OR TOXIC RESIDUES. THE SYSTEM WILL BE INSTALLED IN INDIVIDUAL VEHICLES, AND WILL BE WELL-SUITED FOR RETROFIT APPLICATION TO EXISTING VEHICLES.

NEW HORIZONS DIAGNOSTICS
9110 RED BRANCH RD
COLUMBIA, MD 21045
Program Manager: DAVID MILLER
Contract #:
Title: DETECTION OF LARGE MOLECULAR WEIGHT TOXINS
Topic #: A90-049 Office: CRDEC ID #: 39497

NEW HORIZONS DIAGNOSTICS (NHD) HAS SEVERAL PATENTS FOR NOVEL RAPID AND SIMPLE LIGAND-RECEPTOR ASSAYS. NHD'S GOAL HAS BEEN TO PRODUCE ASSAYS SIMPLE ENOUGH TO BE PERFORMED BY UNSKILLED OR UNTRAINED INDIVIDUALS WITHOUT ANY EQUIPMENT NEEDS. THROUGH THE COMMERCIAL INTRODUCTION OF THE DIRECT GROUP A STREP SMART (SENSITIVIE MEMBRANE ANTIGEN RAPID TEST), NHD HAS PROVEN ITSELF TO BE IN THE FOREFRONT OF RAPID IMMUNO-DIAGNOSTIC TECHNOLOGY. THE GROUP A STREP SMART CAN DETECT AS FEW AS 2000 STREPTOCOCOCCI FROM A SWAB IN LESS THAN 7 MINUTES. IN CLINICAL EVALUATION, THE SMART HAS PROVEN TO BE MORE SIMPLE AND SIGNIFICANTLY MORE SENSITIVE THAN LATEX AGGLUTINATION, ELISA-MEMBRNE, OR LIPOSOME-MEMBRANE BASED GROUP A STREP ASSAYS. THE SMART PROCEDURE USES A SWAB FOR SAMPLE COLLECTION, WHICH IS REACTED WITH A METAL SOL LABELED ANTIBODY ON A MEMBRANE, APPEARING AS A PINK TO PURPLE SPOT. THE SMART KIT IS STORES AND PERFORMED AT ROOM TEMPERATURES AND THEREFORE IS CAPABLE OF BEING USED AS A FIELD DETECTOR/IDENTIFICATION KIT. IN THE PHASE I PROGRAM, A PROTOTYPE RAPID AND SIMPLE ASSAY IN THE SMART FORMAT WILL BE PROVIDED TO DETECT UP TO THREE LARGE MOLECULAR WEIGHT TOXINS, USING GOBERNMENT-FURNISHED REAGENTS.

M-DOT INC
34165 S 48TH ST - STE 2
PHOENIX, AZ 85040
Program Manager: BRYAN J SEEGERS
Contract #:
Title: FABRICATION AND TESTING OF A LOW COST PULSE JET
Topic #: A90-050 Office: MICOM ID #: 39498

THIS DOCUMENT DESCRIBES A PROPOSAL BY M-DOT INC. TO DESIGN, FABRICATE AND TEST A 110 LB. THRUST PULSEJET ENGINE TO BE USED AS A RESEARCH TOOL TO EVALUATE THE FOLLOWING CONCEPTS: 1. MICROPRO- CESSOR CONTROLLED ELECTRIC FUEL INJECTION. 2. HIGH DURABILITY VALVED AND VALVELESS INLET DESIGNS. 3. OXYGENATED FUEL BLENDS FOR INCREASED THRUST. THE PHASE I PROGRAM WOULD ACCOMPLISH THE FOLLOWING TASKS: 1. DESIGN AND CONSTRUCTION OF A BASIC

VALVED TEST ENGINE WITH CONTINUOUS FEED FUEL SYSTEM. 2. STATIC TESTING OF SAME TO VERIFY PERFORMANCE. 3. FABRICATION AND TEST OF ALTERNATE INLET VALVE CONFIGS. 4. FABRICATION ND TEST OF A CLOSED LOOP, MICROPRO- CESSOR CONTROLLED FUEL INJECTION SYSTEM. ALL DESIGN AND FABRICATION WORK WILL BE ACCOMPLISHED AT THE M-DOT FACILITY IN PHOENIX. TESTING WILL BE ACCOMPLISHED ON A TRUCK MOUNTED, FULLY INSTRUMENTED TEST STAND AT A REMOTE LOCATION.

CAMBRIDGE HYDRODYNAMICS INC
PO BOX 1403
PRINCETON, NJ 08542
Program Manager: DR CHARLES P VERDON
Contract #:
Title: SLUGLESS MULTIPLE HIGH VELOCITY PULSE SHAPED CHARGE JETS
Topic #: A90-051 Office: MICOM ID #: 39499

THIS PROPOSAL IS TO APPLY COMPUTATIONAL FLUID DYNAMIC (CFD) SIMULATIONS TO DESIGN SLUGLESS HIGH VELOCITY PULSE SHAPED CHARGE WARHEADS FOR ARMOR PENETRATION. WE HVE DEVELOPED A NEW AND VERY NOVEL CODE ELPIC (EXTENDED LAGRANGIAN PARTICLE IN CELL CODE) WHICH OVERCOMES THE NORMALLY ENCOUNTERED DIFFICULTIES OF BOTH EULERIAN AND LAGRANGIAN CFD CODES FOR THESE PROBLEMS. USING THIS HIGHLY RELIABLE AND EFFICIENT COMPUTER CODE, WE HAVE ALREADY SUCCEEDED IN PRELIMINARY DESIGNS THAT COMBINE SPATIALLY-DISTRIBUTED SHAPED CHARGES IN A HIGH- PRECISON SYNCHRONOUS ACTION IN NOVEL WAYS IN ORDER TO GENERATE PULSE SHAPED LINER JETS OF PRE-ORDAINED SHAPE AND PARAMETERS. IN PHASE I OF THIS SBIR PROGRAM, WE PROPOSE TO EXPLORE A TWO-DIMENSIONAL (CYLINDRICAL GEOMETRY) ELPIC MODEL WHICH WE BELIEVE CONTAINS THE SALIENT PHYSICAL FEATURES NECESSARY TO DESIGN AND PARAMETRIZE THE COMPLEX PROCESSES ASSOCIATED WITH MULTIPLE PULSE SHAPED CHRGE DESIGNS. WE SHALL ALSO USE RENORMALIZATION GROUP (RNG) METHODS, DEVELOPED RECENTLY BY US, TO GIVE A 'SUB-GRID-SCALE VISCOSITY' TO TREAT THE INTERACTION BETWEEN THE SHOCK AND FLUID TURBULENCE IN THE PROJECTILE IMPACT PROCESS. IN PARTICULAR, WE HAVE DEVELOPED THE 'ACTIVE SLUG TRAP PRINCIPLE' WHICH WE BELIEVE TO BE A KEY NEW IDEA FOR THE DESIGN OF MULTIPLE SLUGLESS PULSE SHAPED CHARGE PROJECTILES.

ENGINEERING INNOVATIONS
11032 WATERTON RD
LITTLETON, CO 80125
Program Manager: ROBERT C GRESKA
Contract #:
Title: LOW COST COLLAPSIBLE MULTI-SHAPE MANDREL
Topic #: A90-052 Office: MICOM ID #: 39500

THIS PROPOSAL CONSISTS OF USING A LOW COST FORMABLE MANDREL MATERIAL WHICH IS CAPABLE OF EASY REMOVAL THROUGH SMALL OPENINGS. THESE MANDRELS CAN BE PURCHASED IN DIFFERENT ALLOY FORMS TAILORED TO WITHSTAND THE REQUIRED CURE TEMPERATURES AND PRESSURES ASSOCIATED WITH GRAPHITE/EPOXY AND GRAPHITE/THERMOPLASTIC COMPOSITE FABRICATION. THIS PROPRIETARY MATERIAL (STANDARD COMMERCIAL ITEM) HAS A COEFFICIENT OF THERMAL EXPANSION MUCH MORE CLOSELY MATCHED TO GRAPHITE COMPOSITES THAN DOES THE CONVENTIONAL ALUMINUM OR STEEL MANDRELS.

SYSTEM DYNAMICS INTERNATIONAL INC
1211 NW 10TH AVE
GAINESVILLE, FL 32601
Program Manager: DR TUSHAR K GHOSH

Contract #:
Title: ALIGNMENT TRANSFER FOR HELICOPTER LAUNCHED INERTIALLY GUIDED MISSILES
Topic #: A90-054 Office: MICOM ID #: 39501

THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO DESIGN AN IN-FLIGHT TRANSFER ALIGNMENT SCHEME FOR THE INERTIAL MEASUREMENT UNIT (IMU) OF A HELICOPTER-LAUNCHED INERTIALLY GUIDED MISSILE. THE MISSILE, MOUNTED ON A HELICOPTER WING, IS SUBJECTED TO LARGE AMPLITUDE VIBRATIONS. CURRENT TRANSFER ALIGNMENT SCHEMES, DESIGNED FOR AIRPLANES OR GROUND APPLICATIONS, DO NOT ESTIMATE THE VIBRATION COMPONENT OF THE IMU MOTION. CONSEQUENTLY, THESE CURRENT SCHEMES DO NOT PROVIDE ESTIMATES OF INSTANTANEOUS MISSILE POSITION, AND THEREFORE, MAY NOT HAVE THE ALIGNMENT ACCURACY REQUIRED FOR A HELICOPTER-LAUNCHED INERTIALLY GUIDED MISSILE. THE INNOVATIVE ALIGNMENT SCHEME PROPOSED HEREIN EXPLICITY MODELS THE MISSILE VIBRATION MODES WITHIN THE TRANSFER ALIGNMENT KALMAN FILTER. MODELING WILL BE CONDUCTED BY ANALYZING AVAILABLE MISSILE VIBRATION DATA. CANDIDATE ALIGNMENT FORMULATIONS INVOLVING ATTITUDE, VELOCITY, AND POSITION MATCH BETWEEN THE MISSILE IMU AND THE CARRIER HELICOPTER INERTIAL NAVIGATION SYSTEM (INS) WILL BE EVALUATED AND COMPARED THROUGH COMPUTER SIMULATION. AN INNOVATIVE OPTICAL ALIGNMENT SCHEME WILL ALSO BE EXAMINED TO FURTHER IMPROVE THE ALIGNMENT PROCESS FOLLOWING THE INITIAL TRANSFER ALIGNMENT.

ADVANCED MOTION CONTROLS INC
PO BOX 379
PRINCETON, WI 54968
Program Manager: GEORGE H HOLLING
Contract #:
Title: ELECTRO-MECHANICAL (EM) ACTUATOR DRIVER
Topic #: A90-055 Office: MICOM ID #: 39986

THE PROJECT WILL DEVELOP A NOVEL MINIATURE PULSE WIDTH MODULATED POWER DRIVER FOR ACTUATORS, I.E. DC MOTOR. THE POWER DRIVER WILL DELIVER 50 AT 50VDO IN A DOUBLE INON PACKAGE. THIS COMPACT DESIGN CAN ONLY BE ACHIEVED THROUGH THE INNOVATIVE COMBINATION OF MODER POWER SEMICONDUCTOR TECHNOLOGIES, PROPRIETORY CIRCUIT DESIGN, AND STATE-OF-THE-ART PACKAGING TECHNOLOGY WHICH UTILIZES NEW HEAT CONDUCTIVE POTTING MATERIALS. THE RESEARCH WILL PROVIDE TOOLS TO ACCURATELY PREDICT THE TOTAL CIRCUIT EFFICIENCY FOR DIFFERENT TYPES OF SUITABLE POWER SEMICONDUCTORS. THE CIRCUIT DESIGNS WILL BE ANALYZED WITH CAE TECHNOLOGY TO PREVENT INTERNAL DEVICE STRESSES DUE TO INCORRECT PRE-DRIVE SIGNALS AND THEMAL STRESS IN THE JUNCTION AREAS. A FULL FEATURE PROOF OF CONCEPT PROTOTYPE WILL RESULT FROM THIS ANALYSIS, INCLUDING VERIFICATION OF FINAL PACKAGE SIZE AND BUDGETARY PRICE INFORMATION.

MICROGRAVITY SYSTEMS INC (MSI)
4215 AL 72E
BROWNSBORO, AL 35741
Program Manager: BILLY R ALDRICH
Contract #:
Title: SYNTHESIS OF CADMIUM SULFIDE
Topic #: A90-056 Office: MICOM ID #: 39503

IN PHASE I, A SYSTEMATIC AND COMPLETE INVESTIGATION ON THE SYNTHESIS OF CADMIUM SULFIDE WILL BE CONDUCTED. CADMIUM SULFIDE (CdS) WILL BE SYNTHESIZED BY TWO METHODS: 1. SPONTANEOUS REACTION BETWEEN DIMETHYLCADMIUM AND HYDROGEN SULFIDE, AND 2. REACTION OF CADMIUM AND SULFUR ELEMENTS BY VAPOR DEPOSITION. THE CdS POWDER OBTAINED FROM THESE TWO TECHNIQUES WILL BE HEAT-TREATED BY BAKING OUT AT ELEVATED TEMPERATURES UNDER VACUUM CONDITION TO

ADJUST ITS STOICHIOMETRY. VARIOUS ANALYSES, INCLUDING ATOMIC ABSORPTION SPECTROSCOPY, SPARK SOURCE MASS SPECTROSCOPY AND ENERGY DISPERSION OF X-RAY ANALYSIS, WILL BE PERFORMED ON EACH BATCH OF CdS TO CHARACTERIZE THE PURITY AND STOICHIOMETRY. THE OPTIMAL SYNTHESIS PARAMETERS WILL BE ESTABLISHED.

METRO-LASER
18006 SKYPARK CIR - #108
IRVINE, CA 92714
Program Manager: DR JAMES D TROLINGER
Contract #:
Title: CONCEALED HELICOPTER SENSOR
Topic #: A90-057 Office: MICOM ID #: 39504

THIS IS A PROPOSAL TO DEVELOP A LASER ACOUSTIC DOPPLER SENSOR (LADS), FOR DETECTING CONCEALED MILITARY HARDWARE, SUCH AS A HELICOPTER, HOVERING BEHIND AN OBSTRUCTION OR FLYING NAP OF THE EARTH. RECENT ADVANCES IN THE TECHNOLOGY OF LIDAR, PULSED LASERS, AND SIGNAL PROCESSING HAVE PRODUCED AN EXCELLENT CANDIDATE FOR SOLVING THIS CRITICAL PROBLEM. THE PROPOSED SYSTEM IS A LASER DOPPLER DETECTION AND RANGING SYSTEM THAT PROJECTS LIGHT FROM A PULSED LASER BY MEANS OF A CASSEGRAINEAN TELESCOPE TO A REGION NEAR THE SUSPECTED LOCATION OF CONCEALMENT. LIGHT FROM THE LASER UDERGOES SCATTERING AND ABSORPTION BY AIRBORNE PARTICLES AND GASES IN THE VICINITY OF THE MILITARY HARDWARE. THE LIGHT WHICH IS SCATTERED BACK TO THE SENDER CARRIES THE SIGNATURE OF THE HELICOPTER. A NOVEL SIGNAL PROCESSING PROCEDURE CAN IMPROVE THE EFFICIENCY OF THE PROCESS BY ORDERS OF MAGNITUDE. THE PROPOSED EFFORT WILL EXAMINE SIGNATURES OF MILITARY HARDWARE ON THE BACKSCATTERED SIGNAL BOTH EXPERIMENTALLY AND ANALYTICALLY.

MIRAGE SYSTEMS INC
537 LAKESIDE DR
SUNNYVALE, CA 94086
Program Manager: DR DONALD E BARRICK
Contract #:
Title: ACQUISITION AND CLASSIFICATION OF HELICOPTERS IN DEFILADE
Topic #: A90-057 Office: MICOM ID #: 39505

DETECTION AND CLASSIFICATION OF FRIEND-OF-FOE FOR HELICOPTERS OUT OF LINE-OF-SIGHT IS ADDRESSED. A SYSTEM CONCEPT USING BI-STATIC RADAR PRINCIPLES AND OPERATING IN THE HIGH HF/LOW VHF RANGE IS DESCRIBED. THE SYSTEM PROVIDES BELOW LINE-OF-SIGHT OPERATION BY UTILIZING GROUND WAVE PROPAGATION. THE RANGE TO TARGET GOALS ARE MET BECAUSE OF SMALL, INEXPENSIVE RECEIVERS CARRIED BY FIRE TEAMS. THE TRANSMITTER IS TRUCK MOUNTED AND OPERATES FROM A SECURE LOCATION. SYSTEM PRINCIPLES AND OPERATION IS EXPLAINED. INITIAL CALCULATIONS, SUPPORTED BY EXPERIENCE, SHOW POTENTIAL FEASIBILITY. A PLAN FOR FURTHER ANALYSIS AND FEASIBILITY CONFIRMATION IS PROVIDED.

SPECTRAL SCIENCES INC
99 S BEDFORD ST - #7
BURLINGTON, MA 01803
Program Manager: JOHN GRUNINGER
Contract #:
Title: THE QUICK IMAGE DISPLAY (QUID) MODEL
Topic #: A90-058 Office: MICOM ID #: 39506

WE PROPOSE TO DELIVER A QUICK IMAGE DISPLAY MODEL FOR INFRARED TARGETS. THE PROPOSED

MODEL WILL MAKE FULL UTILIZATION OF THE AVAILABLE HARDWARE ON THE IRIS GRAPHICS WORKSTATION. IT WILL BE DESIGNED SO THAT ITS PROCEDURES WILL BE DIRECTLY APPLICABLE TO THE HARDWARE UTILIZED BY THE SIX DEGREES OF FREEDOM FLIGHT SIMULATOR. IT WILL BE ACCURATE FOR RANGE STUDIES SINCE ALL EFFECTS OF ATMOSPHERIC PATH CHANGES WILL BE INCLUDED. IT WILL HAVE TWO OPTIONS FOR DIRECTIONAL EMITTANCE AND BIDIRECTIONAL REFLECTANCE. ONE OPTION WILL USE THE SSI MODEL THAT IS CURRENTLY IN SPIRITS AND IN SSTIRS. THE OTHER OPTION IS A NOVEL UTILIZATION OF THE WORKSTATION'S LIGHTING MODELS WHICH WILL YIELD A DIRECTIONAL EMISSIVITY AND A BRDF THAT SATISFIES ENERGY CONSERVATION. THE COMBINATION OF ACCURACY AND SPEED FOR ALL ASPECTS WILL MAKE THE MODEL A USEFUL TOOL FOR THE ANALYSIS OF TARGET DEGRADATION AS A FUNCTION OF RANGE. A PROTOTYPE MODEL WILL BE DELIVERED AT THE END OF PHASE I.

TVI CORP
10700 HANNA ST
BELTSVILLE, MD 20705
Program Manager: GARRY COFFEY
Contract #:
Title: THE FEASIBILITY ANALYSIS FOR AN ARRAYED DISCREET ELEMENT COMPUTER-CONTROLLED INFRARED BAR TARGET
Topic #: A90-059 Office: MICOM ID #: 39507

AN INVESTIGATION WILL BE CONDUCTED TO IDENTIFY CANDIDATE MATERIALS AND TECHNOLOGIES TO ENABLE THE DESIGN AND FEASIBILITY ANALYSIS OF A COMPUTER-CONTROLLED REMOTELY OPERATED THERMAL BAR TARGET. THIN FILM HEATERS AND TRANSONIC AIR FLOW CHAMBERS WILL BE AMONG THE TECHNOLOGIES CONSIDERED FOR PROVIDING HEATING AND COOLING CAPACITIES REQUIRED TO ENABLE THE PROPOSED DEVICE TO FUNCTION AT A LEVEL SUITBLE FOR SUPPORTING FIELD AND FLIGHT CAPTIVE THERMAL SENSOR TESTING. THE REQUIREMENTS FOR THE PROSPECTIVE DEVICE ARE AS FOLLOWS: (1) FRONTAL DIMENSIONS 3mx3m (NOT INCLUDING A 1m BORDER), (2) THE CAPABILITY OF PRESENTING A VARIABLE NUMBER OF TARGET BARS, (3) THE ABILITY TO CHANGE THE RELATIVE ORIENTATION OF THE BARS FROM HORIZONTAL TO VERTICAL, (4) THE CAPABILITY TO MAINTAIN TARGET OPERATING TEMPERATURES RANGING FROM 1.5 TO 10.0 DEG. C ABOVE THE AMIENT BACKGROUND TEMPERATURE, (5) A TOTAL PHYSICAL AND THERMAL CONFIGURATION RESPONSE TIME OF TWO MINUTES OR LESS, (6) A STABLE 0.2 DEG. C THERMAL CONTROL PRECISION OVER THE ENTIRE OPERATING RANGE OF THE TARGET, AND (7) REMOTELY LOCATED COMPUTERIZED MONITORING AND CONTROL OF THE TARGET.

LIGHT AGE INC
6 POWDER HORN DR
WARREN, NJ 07060
Program Manager: JOSEPH PETE
Contract #:
Title: ALEXANDRITE LASER/PHOTOCELL POWER TRANSMISSION SYSTEM
Topic #: A90-060 Office: MICOM ID #: 39508

WE PROPOSE TO DEVELOP AND DEMONSTRATE AN ALEXANDRITE LASER/PHOTOCELL (OPTICAL-TO-ELECTRICAL) POWER TRANSMISSION SYSTEM SUITABLE FOR PROVIDING ELECTRICAL POWER TO MISSILE TELEMETRY ELECTRONICS DURING ELECTROMAGNETIC ENVIRONMENTAL EFFECTS TESTS. THE PROPOSED GROUND- BASED LASER (OPTICAL POWER SOURCE) WILL BE RELATIVELY COMPACT AND EMENABLE TO CONVENIENT FIELD OPERATION. THE PHOTOCELL AND ASSOCIATED POWER CONVERSION MODULE ARE TO BE CONTAINED IN A VOLUME 2 INCHES IN DIAMETER AND 2 INCHES IN HEIGHT AND WILL BE COMPATIBLE WITH TEST REQUIREMENTS. THE OPTICAL SOURCE AND POWER CONVERSTION MODULE ARE COUPLED BY A LOW LOSS OPTICAL FIBER POWER TRANSMISSION LINK. A BASELINE SYSTEM PROTOTYPE WILL BE CONSTRUCTED AND EVALUATED. IT WILL CONSIST OF: 1) A CONTINUOUS WAVE (CW) ALEXANDRITE LASER SOURCEEMITTING SEVERAL WATTS OF OPTICAL POWER AT WAVELENGTHS AT OR

NEAR 750 nm; 2) A Si OR GaAs PHOTOCELL/POWER MODULE CAPABLE OF PUTTING OUT IN EXCESS OF 24 V AT CONVERSION EFFICIENCIES NEAR OR ABOVE 10%; 3) A FUSED SILICA OPTICAL FIBER LINK.

TECHNOLOGY INTERNATIONAL INC
429 W AIRLINE HWY - STE S
LaPLACE, LA 70068
Program Manager: SHERMAN RICHARDSON
Contract #:
Title: COMBINATION SEAL/EASY-OPEN FEATURE FOR TRAY PACKS
Topic #: A90-061 Office: NATICK ID #: 39509

FOOD RATIONS ARE PACKAGED FOR MILITARY AND CIVILIAN USE AS A PRECOOKED, PREMEASURED MEAL PORTION. THESE MEALS ARE TYPICALLY ASSEMBLED IN A SEALED TRAY AND PRESERVED FOR CONSUMPTION AT A LATER DATE. CURRENT DESIGNS OF MILITARY FOOD TRAYS ARE METALLIC AND MUST BE OPENED WITH A CAN OPENER. THIS POSES SEVERAL UNDESIRABLE CHARACTERISTICS. AMONG THESE ARE READY ACCESS TO A CAN OPENER. LOSS OF THE CAN OPENER FORCES USE OF A KNIFE OR BAYONET WHICH MAY BE UNSANITARY. THE CAN OPENER AND THE KNIFE BOTH PRODUCE UNDESIRABLE SHARP EDGES. ALSO, THE METAL TRAY CANNOT BE HEATED BY QUICK METHODS. THE METAL TRAYS ALSO HAVE THE POTENTIAL TO PRODUCE EXCESSIVE NOISE IN FIELD OPERATIONS IN TRANSPORT AND IN OPENING FOR CONSUMPTION. AN EASY OPENING MECHANISM WILL BE DEVELOPED THAT WILL BE ADAPTABLE TO THE CURRENT METAL FOOD TRAYS AS WELL AS THE POLYMERIC ONES UNDER DEVELOPMENT. THE MECHANISM WILL SEAL THE CONTENTS AND WILL BE QUIET IN OPERATION.

MEASUREMENT TECHNOLOGY NORTHWEST
2721 NE BLAKELEY ST
SEATTLE, WA 98105
Program Manager: F TIMOTHY O'NEILL
Contract #:
Title: DEVELOPMENT OF A HEAT PIPE THERMAL MANIKIN WITH AN IRRIGATED SKIN
Topic #: A90-062 Office: NATICK ID #: 39510

THE ACCURACY OF CLO VALVES MEASURED WITH A THERMAL MANIKIN IS STRONGLY DEPENDENT ON THE DEGREE TO WHICH THE SKIN TEMPERATURE IS KNOWN. SPATIAL AND SET-POINT TEMPERATURE VARIATIONS COMBINE TO INCREASE THE ERROR IN THE MEASUREMENT. ADDITIONALLY, EVAPORATIVE COOLING ACCOUNTS FOR A SIGNIFICANT THERMAL LOSS IN MOST CLOTHING SYSTEMS. MEASUREMENT TECHNOLOGY NORTHWEST (MTNW) PROPOSES AN INNOVATIVE ADAPTATION OF HEAT PIPE TECHNOLOGY TO A 17 ZONE COPPER THERMAL MANIKIN. THIS DESIGN WILL PROVIDE ISOTHERMAL CONDITIONS AT THE CONDENSER SKIN SURFACES. INTEGRATED IN THIS DESIGN IS A NOVEL IRRIGATED SKIN WHICH WILL ACCURATELY REPRODUCE PHYSIOLOGICAL EVAPORATION RATES AND AVOID THERMAL DECOUPLING ASSOCIATED WITH SOFT ARTIFICIAL SKIN SYSTEMS.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR GAJENDRA SAVANT
Contract #:
Title: X(3) POLYMER AGILE LASER FILTERS
Topic #: A90-063 Office: NATICK ID #: 39511

PHYSICAL OPTICS CORPORATION (POC) PROPOSES TO DEVELOP BROADBAND PASSIVE LASER FILTERS WHICH WILL OPERATE IN THE VISIBLE AND NEAR IR PORTION OF THE SPECTRUM. THESE FILTERS WILL USE X(3)

POLYMER MATERIALS AS THE KEY ELEMENT TO WRITE ESSENTIALLY INSTANTANEOUS (SUB-NANOSECOND) REFLECTION HOLOGRAMS AT THE PARTICULAR WAVELENGTH OF THE INCOMING LASER THREAT. PHASE I WILL INCLUDE ALL WORK NECESSARY TO ESTABLISH THE SOUNDNESS OF THE PROPOSED APPROACH, INCLUDING DEMONSTRATIONS OF THE SCIENTIFIC VALIDITY OF THE APPROACH. PHASE I WILL ALSO INCLUDE EXPERIMENTAL VERIFICATION OF THE PRINCIPLE PROPOSED. THIS WILL TAKE THE FORM OF A BREADBOARD DEMONSTRATION. THIS NEW TYPE OF FILTER WILL PERMIT A DEMONSTRATION OF THE EFFECTIVENESS OF THE APPROACH AGAINST ANY ARBITRARILY SELECTED VISIBLE OR NEAR-INFRARED WAVELENGTH (TO 1064 nm), AND YET SHOW ITS POTENTIAL FOR USE IN A LIGHTWEIGHT, HANDHELD DEVICE WITH A WIDE FIELD OF VIEW.

MISSION RESEARCH CORP
PO DRAWER 719 - 735 STATE ST
SANTA BARBARA, CA 93102
Program Manager: ROBERT D EISLER
Contract #:
Title: INTEGRATED BALLISTIC CASUALTY REDUCTION AND BALLISTIC PROTECTION MODEL
Topic #: A90-064 Office: NATICK ID #: 39512

THE PHASE I EFFORT WILL SELECT EXISTING BALLISTIC PENETRATION CODES AND DEVELOP CASUALTY MODELS OF PENETRATING WOUND AND BLUNT TRAMA INJURIES. A PLAN FOR MODEL INTEGRATION AND OPTIMIZATION WILL BE DEVELOPED THAT WILL BE IMPLEMENTED IN PHASE II. THE PHASE II CODE WILL ENABLE DESIGNERS AND MANUFACTURERS OF INDIVIDUAL BODY ARMOR TO ASSESS THE EFFECT OF DESIGN, MATERIAL, AND CONFIGURATIONAL CHANGES IN TERMS THE ARMOR'S CASUALTY REDUCTION POTENTIAL. SEVEN TASKS ARE INCLUDED IN PHASE I. THE FIRST TASK DETERMINES IN CONSONANCE WITH THE GOVERNMENT THE SPECIFIC THREATS, COMPUTER HARDWARE, AND RANGE OF ARMOR MATERIALS TO BE ADDRESSED BY THE PHASE II CODE. THE SECOND TASK SELECTS BALLISTIC PENETRATION MODELS AND DETERMINES HOW THEY SHOULD BE OPTIMIZED. THE THIRD TASK MODIFIES EXISTING SINGLE LAYER ARMOR DEFORMATION MODELS AND THROUGH DISPLACEMENT COMPATIBILITY CONDITIONS INTEGRATES THE MODELS FOR MULTILAYER ASSEMBLIES. THE FOURTH TASK DEVELOPS CASULTY MODELS FOR PENETRATING WOUNDS AND BLUNT TRAUMA. THE FIFTH TASK ASSEMBLIES A WOUNDING DATA BASE AND DATABASE OF ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS. THE SIXTH TASK DEVELOPS STOCHASTIC MODELS THAT ACCOUNT FOR THE PROBABILITY OF SERIOUS INJURY WEIGHTED AGAINST THE LIKELIHOOD OF CRITICAL BODY PART EXPOSURE AS WELL AS THE VARIATION IN THE MATERIAL PROPERTIES BEING USED AND INTRINSIC DATA SCATTER. THE SEVENTH TASK IS CONCERNED WITH CONTRACT DELIVERABLES.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
Program Manager: ROCKY F ARNOLD
Contract #:
Title: NEW GASKET CONCEPTS USING CONDUCTIVE COMPOSITE MATERIALS
Topic #: A90-065 Office: NATICK ID #: 39513

THE OBJECTIVE OF THIS PHASE I RESEARCH IS TO IDENTIFY LOW COST, CORROSION RESISTANT GASKET CONCEPTS AND COMPOSITE MATERIALS WHICH CAN BE USED TO HARDEN THE DOOR SEALS OF A SHELTER AGAINST EMI/EMP THREATS. THE GASKET PERFORMANCE REQUIREMENTS SPECIFIED BY THE ARMY ARE STRINGENT, BUT WITH THE RECENT DEVELOPMENT OF CONDUCTIVE POLYMERS AND FIBER REINFORCED COMPOSITE MATERIALS, SUCH REQUIREMENTS CAN BE MET. THE RESEARCH PROPOSED HEREIN IDENTIFIES A NUMBER OF NEW GASKET CONCEPTS AND MATERIAL TECHNOLOGIES FOR INITIAL EVALUATION AND SCREENING. SEVERAL GASKET CONCEPTS WILL BE SELECTED FOR FURTHER EXPERIMENTAL EVALUATION FOR SHIELDING EFFECTIVENESS IN ACCORDANCE WITH MIL-STD-907B AND MIL-STD-285 PROCEDURES. BASED UPON THE SHIELDING EFFECTIVENESS (-60 dB AT 100 kHz MAGNETIC IS THE REQUIRE- MENT) OF THE

GASKET CONCEPT AND ASSOCIATED MATERIALS, CORROSION RESISTANCE, AND OTHER FACTORS SUCH AS COST, EASE-OF-FABRICATION, RESISTANCE TO OTHER ENVIRONMENTAL FACTORS (HUMIDITY, TEMPERATURE), AND RESISTANCE TO COMPRESSION SET, SEVERAL CANDIDATE GASKET CONCEPTS WILL BE RECOMMENDED FOR FURTHER STUDY AND DEVELOPMENT DURING ANY PHASE II WORK.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
Program Manager: DR M EISENBERG
Contract #:
Title: DEVELOPMENT OF LIGHTWEIGHT QUIET POWER SOURCE
Topic #: A90-066 Office: NATICK ID #: 39515

A NOVEL CONCEPT FOR A LIGHTWEIGHT QUIET POWER SOURCE FOR A COOLING BACKPACK IS PRESENTED. A DYNAMIC HIGH ENERGY FLOW BATTERY OPERATING NEAR ROOM TEMPERATURE WITH AN ELECTRICAL OUTPUT OF 300-400 WATTS IS PROPOSED THAT CAN BE READILY SHUT-DOWN AND RESTARTED. THE ATTRACTIVENESS OF THE NEW SYSTEM IS BASED ON: a) VERY HIGH ENERGY DENSITY; b) POTENTIAL BROAD RANGE OF POWER DENSITY CAPABILITIES, c) SAFETY OF THE SYSTEM AND REACTANTS (AQUEOUS ELECTROLYTE); d) LOW COST OF REACTANTS PER UNIT ENERGY GENERATED. THE PHASE I PROGRAM IS DESIGNED TO DEVELOP THE PRELIMINARY DESIGN CONCEPT AND EVALUATE THE DYNAMIC CATHODE WITH TWO VARIANTS OF THE ELECTROLYTE AND TO OBTAIN INITIAL CELL PERFORMANCE DAATA FROM A SMALL LAB CELL. A PRELIMINARY DESIGN APPROACH FOR A 360 WATT POWER SOURCE WILL BE DEFINED FOR DEVELOPMENT IN PHASE II.

STIRLING TECHNOLOGY CO
2952 GEORGE WASHINGTON WY
RICHLAND, WA 99352
Program Manager: CARL D BECKETT
Contract #:
Title: DEVELOPMENT OF A LIGHTWEIGHT QUIET POWER SOURCE
Topic #: A90-066 Office: NATICK ID #: 39514

STIRLING TECHNOLOGY COMPANY (STC) WILL DEVELOP AND TEST A LONG LIFE, HIGH EFFICIENCY, LOW VIBRATION, HIGH POWER DENSITY STIRLING CYCLE ENGINE SYSTEM TO SERVE AS A POWER SOURCE FOR A MICROCLIMATE COOLING BACKPACK. THE KEY OBJECTIVES FOR THE SYSTEM ARE HIGH EFFICIENCY, HIGH POWER DENSITY OF THE MACHINE, SUITABILITY AS A PERSONAL BACKPACK UNIT AND LONG LIFE. HIGH EFFICIENCY WILL RESULT FROM A STIRLING CYCLE ENGINE FEARURING 1) MINIMAL DEAD VOLUME, 2) ADVANCE REGENERATOR TECHNOLOGY AND IMPLEMENTATION AND RELATIVELY DIRECT COUPLING BETWEEN THE POWER PISTON AND THE FREON COMPRESSOR. HIGH POWER DENSITY WILL BE ACCOMPLISHED BY A COMPACT LAYOUT, HIGH-SPEED OPERATION, AND HIGH PRESSURE. COMPATIBILITY WITH HUMANS IS ACHIEVED BY ENSURING LOW VIBRATION BY KEEPING THE OSCILLATING MASSES CO-LINEAR AND BALANCED. LONG LIFE WILL BE ENSURED THROUGH THE USE OF FLEXURAL BEARINGS OR BY PROVIDING HYDRAULIC LUBRICATION. SPECIFIC TECHNICAL OBJECTIVES FOR PHASE I ARE 1) DEVELOP SEVERAL CONCEPTUAL DESIGNS, 2) DEVELOP ENOUGH DATA SO THAT THE CONCEPTUAL DESIGNS CAN BE RANKED, AND 3) ASSESS THE PROBABLE SUCCESS OF THE FAVORED CONECPT. STC WILL UTILIZE IN HOUSE EXPERTISE AND ONGOING RESEARCH EFFORTS, CURRENT LITERATURE, AND ANALYSIS SOFTWARE TO ACCOMPLISH PHASE I TASKS. PHASE II OBJECTIVES ARE TO REFINE THE PHASE I BASELINE SYSTEM, AND THEN TO DETAIL, FABRICATE, ASSEMBLE, AND TEST THE SYSTEM.

PROTEIN POLYMER TECHNOLOGIES INC
10655 SORRENTO VALLEY RD - 1ST FL

SAN DIEGO, CA 92121
Program Manager: DR JOSEPH CAPPELLO
Contract #:
Title: SPINNING OF HIGH STRENGTH FIBERS FROM ENGINEERED CRYSTALLINE PROTEIN POLYMERS
Topic #: A90-067 Office: NATICK ID #: 39516

PROTEIN POLYMER TECHNOLOGIES, INC. HAS DEVELOPED SYSTEMS AND PROCEDURES FOR PRODUCING HIGH MOLECULAR WEIGHT PROTEINS OF EXACT REPETITIVE OLIGOPEPTIDE SEQUENCES THROUGH THE SYNTHESIS AND EXPRESSION OF SYNTHETIC GENES. SAMPLE QUANTITIES OF FROM 15 TO 150 GRAMS OF SIX DIFFERENT PURIFIED PROTEIN POLYMERS HAVE BEEN PRODUCED AND NO OBSTACLES PROHIBITING THE PRODUCTION OF THESE POLYMERS IN LARGE SCALE ARE FORESEEN. THE COMPANY PROPOSES TO DEFINE THE MECHANICAL PROPERTIES OF FOUR OF THE POLYMERS IN FIBER FORM AND RELATE THE DIFFERENCES IN PROPERTIES BETWEEN FIBERS TO THE DIFFERENCES IN THEIR MOLECULAR STRUCTURE. THE BASIC REPEATING UNIT COMMON TO ALL OF THE POLYMERS, DESIGNED TO ADOPT A CRYSTALLINE BETA SHEET STRUCTURE, IS THE GAGAGS HEXAMER PREVALENT IN SILK FIBROIN. THE FOUR POLYMERS COMPRISE A FAMILY OF PRECISELY CONTROLLED BLOCK SEQUENCE STRUCTURES DESIGNED TO MODULATE THE CRYSTALLINE PROPERTIES OF THE MOLECULES. FIBERS WILL BE PRODUCED FROM SAMPLES OF THE FOUR POLYMERS BY SOLUTION SPINNING PROCEDURES DEVELOPED DURING THE COURSE OF THE PROJECT. ORIENTATION OF THE POLYMER CHAINS IN THE FIBERS WILL BE ASSESSED BY X-RAY DIFFRACTION AND FTIR DICHROISM STUDIES. STRESS/STRAIN PROFILES FOR EACH FIBER TYPE WILL BE DETERMINED.

RED-ZONE ROBOTICS INC
401 BINGHAM ST
PITTSBURGH, PA 15203
Program Manager: SANJIV SINGH
Contract #:
Title: ROBOTIC CONVOY CAPABILITY
Topic #: A90-069 Office: TACOM ID #: 39517

RED-ZONE ROBOTICS WILL DEVELOP A ROBOTIC CONVOY CAPABILITY BASED ON TWO APPROACHES TO ROBOTIC VEHICLE NAVIGATION: TARGET TRACKING VIA PASSIVE VISION AND PATH TRACKING VIA GPS-AIDED INERTIAL GUIDANCE. TARGET TRACKING USES A CAMERA AND IMAGE PROCESSOR ON THE SLAVE VEHICLE TO FOLLOW A PATTERN AFFIXED TO THE LEADING VEHICLE, SERVOING THE SLAVE VEHICLE'S MOTIONS TO MAINTAIN A GIVEN DISTANCE AND ORIENTATION BETWEEN THE TWO VEHICLES. IN PATH TRACKING, THE TELEOPERATED LEAD VEHICLE BUILDS A CARTESIAN MAP OF ITS PATH; THIS PATH IS TRANSMITTED TO EACH OF THE SLAVE VEHICLES, WHICH FOLLOW THE PATH WHILE MAINTAINING SAFE FOLLOWING DISTANCE VIA A MEDIUM-RANGE PROXIMITY SENSOR. THE TWO APPROACHES DIFFER IN THE CONVOY TACTICS THEY SUPPORT AND THEIR TECHNICAL COMPLEXITY. RED-ZONE WILL EVALUATE THE TWO APPROACHES, SELECTING ONE BASED ON TACOM OBJECTIVES AND TECHNICAL ANALYSES. THE SELECTED APPROACH WILL BE DEFINED IN A COMPUTER SIMULATION. SOFTWARE FOR STATE ESTIMATION, VEHICLE DYNAMICS, AND VEHICLE CONTROL WILL BE DEVELOPED AND TESTED IN THE SIMULATION. THE SOFTWARE MODULES WILL BE INTEGRATED TO DEFINE A COMPUTATIONAL ARCHITECTURE, SPECIFIED AS COMMERCIALLY AVAILABLE COMPONENTS ON A VME BUS. PHASE I WILL RESULT IN A DESIGN DOCUMENT SUPPORTING BREADBOARD PROTOTYPING AND VEHICLE TESTING IN PHASE II.

PHYSICS MATHEMATICS & COMPUTERS INC
PO BOX 787
SOCORRO, NM 87801
Program Manager: PATRICK BUCKLEY
Contract #:
Title: ADVANCED CONCEPT EVALUATION

Topic #: A90-070 Office: TACOM ID #: 39518

THE PROPOSED RESEARCH IS TO INTEGRATE A NUMBER OF ARMOR DESIGN AND EVALUATION MODELS INTO A MODERN COMPUTING ENVIRONMENT HOSTED BY A DEDICATED WORKSTATION. THE EVENTUAL PRODUCT WILL UTILIZE A GRAPHICAL USER INTERFACE, INTERACTIVE GRAPHICS, NETWORKING, AND SO FORTH, TO PROVIDE A MORE PRODUCTIVE COMPUTING ENVIRONMENT FOR THE ARMOR DESIGNER AND ANALYST. THE PHASE I GOALS ARE TO DEVELOP A HARDWARE/SOFTWARE SYSTEM SPECIFICATION FOR THE OVERALL CONCEPT.

PRECISION COMBUSTION INC
25 SCIENCE PK
NEW HAVEN, CT 06511
Program Manager: WILLIAM C PFEFFERLE
Contract #:
Title: CATALYTIC GLOWPLUGS FOR COLD STARTING
Topic #: A90-071 Office: TACOM ID #: 39519

COLD STARTING OF DIESEL ENGINES AT THE MILITARY'S -25 F AND -60 F STANDARDS CONTINUES TO BE A PROBLEM FOR MOST ENGINES, AND EVEN AT TEMPERATURES WHERE THE ENGINES WILL START, THERE MAY BE A SIGNIFICANT WARMUP PERIOD BEFORE APPRECIABLE POWER IS AVAILABLE. CATALYTIC GLOWPLUGS OFFER THE SIMPLICITY OF A GLOWPLUG SYSTEM WITH INCREASED EFFECTIVENESS FROM CATALYTIC ACTIVITY. PRECISION COMBUSTION'S GLOWPLUGS HAVE BEEN SHOWN TO IGNITE ENGINE COMBUSTION AT MUCH LOWER TEMPERATURES THAN STANDARD PLUGS IN A CURRENT NASA SBIR PROGRAM FOR LOW COMPRESSION, DIESEL ROTARY ENGINES. THE LOWER TEMPERATURE OPERATION OFFERS MORE DURABILITY, OR THE PLUG CAN BE OPERATED AT AN INTERMEDIATE TEMPERATURE FOR GREATLY INCREASED EFFECTIVENESS. THUS, A GLOWPLUG CAN BE FABRICATED THAT WILL IGNITE MUCH COLDER FUEL AIR MIXTURES, AND ALLOW ENGINES TO FIRE AND START AT LOWER TEMPERATURES, AS WELL AS RUN MORE SMOOTHLY SOONER. PHASE I WILL ENTAIL PROOF OF CONCEPT TESTING WITH DEMONSTRATION OF COLD START CAPABILITIES IN A DIESEL ENGINE AT -25 F. PHASE II WILL ADAPT THE TECHNOLOGY TO A DIESEL ENGINE IN USE BY THE ARMY.

VIA-SAT INC
6120 PASEO DEL NORTE - J2
CARLSBAD, CA 92009
Program Manager: STEVEN R HART
Contract #:
Title: ROBOTIC VEHICLE COMMUNICATIONS CONTROLLER
Topic #: A90-072 Office: TACOM ID #: 39520

THIS PROPOSAL DESCRIBES AN APPROACH FOR A ROBOTIC VEHICLE COMMUNICATIONS CONTROLLER MEETING THE SOLICITATION ANNOUNCEMENT REQUIREMENTS. IT FOCUSES ON THE MESSAGE PROCESSING ASPECTS OF THE PROBLEM AND SHOWS HOW EXPERT SYSTEM TECHNOLOGY CAN BE APPLIED. THE PROPOSED EXPERT SYSTEM CONSISTS OF A DATABASE OF OPERATIONAL AND SITUATIONAL PARAMETERS THAT DESCRIBE THE STATE OF THE RV SYSTEM. THE EXPERT SYSTEM THAN APPLIED A SET OF RULES (KNOWLEDGE BASE), DRIVEN BY THE DATABASE, THAT INVOKE SPECIFIC COMMUNICATION CONTROLLER ACTIONS (EG. ADJUSTING MESSAGE PRIORITY THRESHOLDS OR RADIO TRANSMIT POWER LEVELS). THE PROPOSAL DISCUSSES KEY OPERATIONAL PARAMETERS THAT INFLUENCE COMM CONTROL RESPONSES, AND INCLUDES A LIST OF CANDIDATE ACTIONS AND ASSOCIATED EFFECTS ON COMMUNICATION PERFORMANCE. THE PROPOSED WORK BUILDS ON VIA-SAT'S SOLID EXPERT SYSTEM EXPERIENCE DERIVED FROM LARGE DOD COMPUTER AND COMMUNICATION SYSTEMS. THE PROPOSED PHASE I WORK BUILDS ON AN EXISTING VIA-SAT EXPERT SYSTEM TOOL FOR MODELING COMMUNICATIONS SYSTEM. IN ADDITION TO THE EXPERT SYSTEM ASPECTS, THE PROPOSAL CONSIDERS IMPORTANT RELATED RV COMMUNICATION SYSTEMS ISSUES, INCLUDING JAM RESISTANCE, ADDRESSING, ROUTING, USE OF MULTIPLE TRANSMISSION

MEDIA, AND SECURITY. THE PROPOSAL INCLUDES SPECIFIC TECHNICAL OBJECTIVES, PROPOSED TASKS, A SCHEDULE, AND DISCUSSION OF RELATED VIA-SAT WORK, INCLUDING EXPERT SYSTEM AND COMMUNICATION NETWORK DESIGN AND SIMULATION TOOLS.

KINETIC SYSTEMS
26240 INDUSTRIAL BLVD
HAYWARD, CA 94545
Program Manager: C G O'NEILL
Contract #:
Title: ELECTRONICALLY VARIABLE VALVE TIMING
Topic #: A90-073 Office: TACOM ID #: 39521

A PROGRAM IS PROPOSED TO ANALYZE, DESIGN AND TEST COMPONENTS FOR A SYSTEM THAT WILL OPERATE THE VALVES OF 4-CYCLE DIESEL AND GASOLINE ENGINES BY MEANS OF HYDRAULIC ACTUATORS, ELECTRONICALLY CONTROLLED. THE CONCEPT EMPLOYS A FEEDBACK POSITION TRANSDUCER THAT PROVIDES A SIGNAL EMPLOYED TO COMPARE ACTUAL VALVE DISPLACEMENT WITH A PRO- GRAMMED DISPLACEMENT AND TO MAKE APPROPRIATE ADJUSTMENTS IN THE POSITION OF A HYDRAULIC FLOW CONTROL VALVE SO THAT ENGINE VALVE TRAVEL ACHIEVED CORRESPONDS TO TRAVEL DESIRED. THE DESIRED OPENING PROGRAM WILL BE VARIED BY SELECTION FROM A RANGE OF SUCH PROGRAMS HELD IN A MICROPROCESSOR AND ACCESSED BY COMBINATIONS OF OPERATING CONDITIONS OF THE ENGINE. THESE PROGRAMS CAN INCLUDE VARIABLE OVERLAP SETTINGS THAT ARE SELECTED BY SPECIFIC COMBINATIONS OF SPEED AND LOAD, TRANSIENT RESPONSE BOOSTER FOR TURBOCHARGED ENGINES, COMPLETE CYLINDER SHUT DOWN FOR IDLE ON HALF THE NUMBER OF CYLINDERS, ZERO OVERLAP FOR COLD STARTING, PARTIAL EXHAUST VALVE OPENING FOR IMPROVED ENGINE BRAKING AND THROTTLE ELIMINATION ON SPARK IGNITED ENGINES. ONCE THE PRINCIPLE OF OPERATING IN RESPONSE TO A MEMORY HELD PROGRAM HAS BEEN REALIZED, ALL THESE FUNCTIONS MAY FOLLOW MERELY BY THE PROGRAMMING PROCESS. A CRITICAL COMPONENT IN THE PROOF OF CONCEPT IS THE PERFORMANCE OF THE HYDRAULIC CONTROL VALVE. FOR THIS REASON A PROTOTYPE OF THE VALVE WILL BE DETAILED DESIGNED AND FABRICATED. AN EXISTING IN-HOUSE POWER SUPPLY WILL BE EMPLOYED TO PRODUCE PRELIMINARY PERFORMANCE DATA ON THIS UNIT.

COMBUSTION & FUEL RESEARCH INC - (CFR)
857-9 S WAGNER RD
ANN ARBOR, MI 48103
Program Manager: DR JOHN C HILLIARD
Contract #:
Title: ENGINE-MOUNTED OIL ANALYSIS SENSOR
Topic #: A90-074 Office: TACOM ID #: 39469

THE WORK PROPOSED IN THIS STUDY WILL TAKE RESULTS FROM CFR LABORATORY RESEARCH OF ENGINE OIL DEGRADATION AND APPLY IT TO THE ARMY'S REQUIREMENT FOR AN ENGINE-MOUNTED SENSOR. THE BASIC CONCEPTS PROPOSED USE SPECIFIC WAVELENGTH RANGES IN THE INFRA-RED TO DETECT DEGRADATION PATTERNS MOST SPECIFICALLY ASSOCIATED WITH THE LOSS OF OIL QUALITY IN DIESEL ENGINES. PHASE I CONCENTRATES PRIMARILY ON LOSS OF DISPERSANCY; PHASE II WILL CONCENTRATE MORE ON OTHER AREAS SUCH AS OXIDATION, LOSS OF ZDP, AND NITRATION. PRELIMINARY RESULTS OF MEASUREMENTS MADE ON DIESEL ENGINE OIL SAMPLES TAKEN DURING A MILEAGE-ACCUMULATION STUDY HAVE SUPPORTED THE CONCEPT THAT IT IS POSSIBLE TO DETECT IMMINENT DISPERSANT FAILURE BY A MEANS OTHER THAN FORMS OF OIL DEGRADATION IS A WELL ESTABLISHED LABORATORY TECHNIQUE. THE SENSOR CONCEPT IS SIMPLE, AND THE OUTPUT SIGNALS WILL BE INTERPRETED BASED ON INCORPORATION OF ACCUMULATED KNOWLEDGE FROM TESTING INTO A CONTROL ALGORITHM.

SHIELDING TECHNOLOGIES INC
40 BRIGHT OAKS DR
BEL AIR, MD 21014
Program Manager: DR DAVID J KATSANIS
Contract #:
Title: EXPLOSIVE NOISE ABATEMENT
Topic #: A90-075 Office: TECOM ID #: 39522

THIS IS A PROPOSAL TO INVESTIGATE THE TECHNICAL FEASIBILITY AND COST EFFECTIVENESS OF VENTED SUPPRESSIVE SHIELDS (VSS) AS A MEANS OF REDUCING THE NOISE LEVELS RESULTING FROM EXPLOSIVE OPERATIONS AND/OR MUNITIONS TESTING. VSS IS DESIGNED TO REDUCE THE EXTERNAL BLAST OVERPRESSURE, FROM AN EXPLOSIVE OPERATION, TO A HUMAN TOLERABLE LEVEL. A HUMAN TOLERABLE LEVEL IS DEFINED AS BEING THAT WHICH WILL NOT CAUSE EARDRUM DAMAGE AT A DISTANCE OF 2 METERS. IN ORDER TO PROVIDE THIS PROTECTION THE EXTERNAL BLAST OVERPRESSURE MUST BE REDUCED TO 2.3 psi OR LOWER. SINCE THERE IS DIRECT RELATIONSHIP BETWEEN BLAST OVERPRESSURE AND SOUND LEVEL (dB), REDUCTION OF EXTERN OVERPRESSURE ALSO RESULTS IN SOUND LEVEL REDUCTION. IN PHASE I, VSS ENCLOSURE CONCEPTS AND DESIGNS WILL BE DEVELOPED TO REDUCE THE EXTERNAL SOUND LEVEL BY A 20 dB GOAL, FROM EXPLOSIVE OPERATIONS AND/OR MUNITIONS TESTING. INFORMATION FROM PRIOR TESTED DESIGNS, AND CALCULATIONS FOR SPECIFIC REQUIREMENTS WILL BE APPLIED, VSS ENCLOSURES, IN ADDITION TO BLAST OVERPRESSURE REDUCTION, SUPPRESS AND CONTAIN FRAGMENTS AND THERMAL HAZARDS.

KRAMER & ASSOCS
121C EUBANK NE
ALBUQUERQUE, NM 87123
Program Manager: WILLIAM RISTAU
Contract #:
Title: IMPROVED PERFORMANCE OF HIGH ENERGY LASER EXHAUST
Topic #: A90-076 Office: TECOM ID #: 39523

THE EFFICIENCY OF THE SCRUBBER ON THE HF HIGH ENERGY LASER WILL BE MEASURED UTILIZING FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR). CONCENTRATIONS OF HF AND FLOWS WILL BE MEASURED BEFORE AND AFTER THE SCRUBBER, AND RECOMMENDATIONS MADE TO IMPROVE SCRUBBER EFFICIENCY, IF NECESSARY. AMBIENT AIR SAMPLING USING EITHER FTIR OR OTHER WET CHEMICAL METHOD WILL BE PERFORMED TO VALIDATE THE MODEL PREDICTIONS OF HF CONCENTRATION GRADIENTS AROUND THE FACILITY.

GNOSTECH INC
650 LOUIS DR - STE 190
WARMINSTER, PA 18974
Program Manager: DAVID W SLOMEANA
Contract #:
Title: SCENARIO GENERATION FOR WHITE SANDS AIR DEFENSE TEST BED
Topic #: A90-078 Office: TECOM ID #: 39524

GNOSTECH'S PROPOSAL FOR A SCENARIO GENERATOR FOR THE WHITE SANDS AIR DEFENSE TEST BED EMBODIES THE ARCHITECTURAL CONSTRUCTS OF USER FRIENDLINESS, CONFIGURED AND MANAGE DATA FILES, SELF-ERROR CORRECTION AND ADAPTATION TO WSMR'S CURRENT EQUIPMENT SUITE. GNOSTECH HAS EXTENSIVE EXPERIENCE IN DEVELOPING REAL-TIME SIMULATION FACILITIES FOR ENGINEERING AND EVALUATION LABORATORIES. THE PROPOSED EFFORT WILL RESULT IN THE RESEARCH AND DESIGN OF THE SCENARIO GENERTOR AND PREPARATION OF A-, B-, AND C- LEVEL SPECIFICATIONS WHICH ARE IN FULL COMPLIANCE WITH MIL-STD-490 AND DOD-STD-2167. THE PHASE I EFFORT WILL ALSO RESULT IN THE DEMONSTRATION OF A CANNED SCENARIO GENERATOR WHICH WILL SHOW WSMR'S TECHNICAL

REPRESENTATIVES THE TECHNOLOGY DESIGNED AND SPECIFIED IN THE THREE SPECIFICATIONS. THE EFFORT WILL ENCOMPASS SIX CALENDAR MONTHS AND $49,963 TO COMPLETE AND GNOSTECH WILL COST-SHARE THE TRAVEL EXPENSES TO AND FROM WHITE SANDS FOR ITS TECHNICAL STAFF.

ADVANCED FUEL RESEARCH INC
PO BOX 380343 - 87 CHURCH ST
EAST HARTFORD, CT 06138
Program Manager: PETER R SOLOMON
Contract #:
Title: MULTI-WAVELENGTH NEPHELOMETER DUST MEASUREMENT SYSTEM
Topic #: A90-079 Office: TECOM ID #: 39525

THE ARMY HAS A REQUIREMENT FOR DEVELOPMENT OF A REAL-TIME MEASUREMENT SYSTEM TO MESURE DUST CONCENTRATIONS WITH SMALL SENSING UNITS SUITABLE FOR MOUNTING ON MILITARY VEHICLES UNDERGOING DUST TESTING. LIGHT SCATTERING IS A LEADING CHOICE OF TECHNIQUES. HOWEVER, THE SCATTERING DATA MUST PERMIT A MEASURE OF PARTICLE SIZE OF PROPERLY RELATE SCATTERING INTENSITY TO DUST CONCENTRATION (I.E. PARTICLE-SIZE COMPENSATION). EXISTING SYSTEMS HAVE LIMITATIONS WITH RESPECT TO PHYSICAL SIZE, PARTICLE SIZE, PARTILE LOADING AND SEVERE ENVIRONMENTS. TO OVERCOME THESE LIMITATIONS, CONSIDERATION MUST BE GIVEN TO THE USE OF WIDER COLLECTION ANGLES, TO USING MORE THAN ONE OPTICAL PATH TO ACCOMMODATE THE LARGE VARIATIONS IN LOADING, AND TO MAKING MEASURE- MENTS AT LONGER WAVELENGTHS WHERE THE COMPOSITION DEPENDENT SCATTERING PROPERTIES WILL COME INTO PLAY. THE OPPORTUNITY FOR SOLUTION OFFERED IN PHASE I, IS A COMBINED EXPERIMENTAL AND THEORETICAL ANALYSIS TO DETERMINE THE SCATTERING PROPERTIES OF THE IMPORTANT SIZES AND COMPOSITIONS OF COMPONENTS IN DUST. ON THE BASIS OF THIS INFORMATION, WE WILL DESIGN A MULTI-WAVELENGTH SYSTEM BASED ON HADAMARD TRANSFORM TECHNOLOGY CAPABLE OF MULTI-ANGLE SCATTERING, TO PROVIDE MAXIMUM DISCRIMINATION BETWEEN PARTICLES OF DIFFERENT SIZES AND COMPOSITIONS. THIS WILL ALLOW ACCURATE DETERMINATION OF COMPENSATION FACTORS TO OBTAIN OVERALL DUST CONCENTRATION LEVELS. DVANCED FUEL RESEARCH, INC. (AFR) IS HIGHLY QUALIFIED TO CARRY OUT THIS BASIC RESEARCH PROGRAM DUE TO ITS EXTENSIVE EXPERIENCE IN RADIATIVE PROPERTIES OF PARTICLES.

BL ASSOCIATES
129 WESTON DR
CHERRY HILL, NJ 08003
Program Manager: BARRY LONGMIRE
Contract #:
Title: RADAR SIGNAL PROCESSOR
Topic #: A90-080 Office: TECOM ID #: 39526

MANY INSTRUMENTATION RADARS (SUCH AS THE MPS-36 AND FPS-16) USED AT WSMR AND OTHER RADAR INSTALLATIONS WORLDWIDE WERE DESIGNED 20-30 YEARS AGO. THIS PROPOSAL ADDRESSES ENHANCEMENTS TO THESE OLDER RADAR SYSTEMS TO INCORPORATE MODERN SIGNAL PROCESSING TECHNIQUES USING A DIGITAL COMPUTER AND SOFTWARE TO PROVIDE IMPROVED TRACKING, TO PROVIDE COHERENT DATA FOR TMR AND OTHER USES, TO PROVIDE IMPROVED RELIABILITY BY REPLACING HARDWARE AND SOFTWARE, AND TO PROVIDE A FLEXIBLE, MODERN CC MPUTER WITH THE CAPACITY FOR GROWTH. PHASE I RESEARCH WILL BE DIRECTED TOWARD COMPUTER SELECTION, ALGORITHM DEFINITION, AND SOFTWARE DESIGN. DURING PHASE II A PROTOTYPE SYSTEM WILL BE DEVELOPED. THIS PROTOTYPE WILL INCLUDE THE COMPUTER WITH PERIPHERAL DEVICES, AN INTERFACE CONTROLLER FOR INPUT/OUTPUT WITH THE MPS-36 RADAR, AND REAL-TIME SOFTWARE OPERATING AT THE RADAR PRF FOR NORMALIZATION, AGC, ANGLE SERVO FILTERING WITH ADAPTIVE TRACKING, AND DATA RECORDING. THE PROTOTYPE SYSTEM WILL BE INTEGRATED AND TESTED AT WSMR USING AN MPS-36 RADAR.

ITE INC
6901-B DISTRIBUTION DR
BELTSVILLE, MD 20705
Program Manager: THOMAS S JOHNSON
Contract #:
Title: PROJECTILE FOLLOWER TRACKING CONTROL SYSTEM
Topic #: A90-081 Office: TECOM ID #: 39527

THE OBJECTIVE OF THIS PROPOSED ENGINEERING DEVELOPMENT IS A FEASIBILITY STUDY AND DESIGN OF AN AUTONOMOUS REAL TIME TRACKING CONTROL SUBSYSTEM FOR A PROJECTILE FOLLOWER TRACKING SYSTEM. THE TRACKING CONTROL SUBSYSTEM WILL EXPAND THE CAPABILITY OF A PROJECTILE FOLLOWER SYSTEM THAT USES A SYNCHRONOUSLY DRIVEN ROTATING MIRROR THAT FOLLOWS THE PROJECTILE MOTION BY: (1) INCORPORATING A SHORT PULSE, HIGH REPETITION RATE LASER RANGING SYSTEM FOR PROJECTILE ILLUMINATION, (2) USING A QUADRANT AVALANCHE OR PINNED PHOTODIODE CENTROID TRACKER TO GENERATE POSITION AND RANGE INFORMATION (3) USING A SMALL INNER LOOP VERY WIDEBAND IMAGE MOTION COMPENSATION MIRROR BEAMSTEERER CONTROLLED BY THE CENTROID TRACKER (4) CORRECTING THE OUTER LOOP LARGE MIRROR WITH THE AVERAGE POSITION OF THE INNER MIRROR (5) ADJUSTING THE FOCUS OF THE OPTICAL DATA ACQUISITION INSTRUMENTATION WITH THE CENTROID TRACKER RANGE INFORMATION (6) EXPANDING THE EXTERNAL INTERFACE ASSEMBLY TO ACCEPT ADDITIONAL CONTROL INFORMATION FROM RADARS, ETC. (7) USING THE SHORT PULSE LASER ILLUMINATION TO DYNAMICALLY EVALUATE THE PERFORMANCE OF OPTICAL IMAGING SYSTEM.

TAU CORP
485 ALBERTO WY
LOS GATOS, CA 95032
Program Manager: PETER ROTHMAN
Contract #:
Title: KNOWLEDGE-BASED ENVIRONMENT FOR DEVELOPING AND TESTING EMBEDDED NEURAL NETWORKS
Topic #: A90-082 Office: TECOM ID #: 39528

NUMEROUS GOVERNMENT AND INDUSTRY RESEARCH AND DEVELOPMENT PROJECTS ARE EXPLORING THE APPLICATION OF NEURAL NETWORKS WITHIN EMBEDDED SOFTWARE SYSTEMS. ALTHOUGH MODELS, IMPLEMENTATIONS, AND APPLICATIONS OF NEURAL NET TECHNOLOGY ARE MULTIPLYING, LITTLE ATTENTION HAS BEEN PAID TO TESTING, BENCHMARKING, AND COMPARING THESE COMPUTATIONAL SYSTEMS. IN FACT, FOR MANY SPECIFIC NEURAL NETWORK ARCHITECTURES LITTLE IS KNOWN ABOUT THEIR CLASSIFICATION AND INFORMATION STORAGE CAPABILITIES. THERE DOES NOT EXIST A SIMPLE, WIDELY ACCEPTED, SET OF TEST CASES WHICH CAN BE UTILIZED TO COMPARE CANDIDATE NEURAL NETWORK ARCHITECTURE, AND EVALUATE THEIR APPLICABILITY TO SPECIFIC EMBEDDED APPLICATIONS. THE PURPOSE OF THIS PROJECT IS THE DEVELOPMENT OF A NEURAL NETWORK KNOWLEDGE-BASED (N2KB). THE N2KB WILL BE DESIGNED TO PROVIDE INFORMATION ON NEURAL NETWORK MODELS, RECOMMENDATIONS ON THE APPROPRIATE NEURAL NETWORK PARADIGMS TO USE IN SPECIFIC APPLICATIONS, FUNCTIONAL PROTOTYPES OF NEURAL NETWORKS, AND NETWORK DEBUGGING AND TESTING FACILITIES.

SYNETICS CORP
540 EDGEWATER DR
WAKEFIELD, MA 01880
Program Manager: J I GALDOS
Contract #:
Title: MULTISTATIC PROJECTILE TRACKING RADAR
Topic #: A90-083 Office: TECOM ID #: 39529

THE OBJECTIVE OF THE PROPOSED WORK IS TO DEMONSTRATE THE SIMULTANEOUS TRACKING OF SUBMUNITIONS AND DEBRIS DISPENSED BY AN ARTILLERY PROJECTILE, WITH A MULTISTATIC RADAR SYSTEM BASED ON THE HAWK VELOCIMETER. SUCH A SYSTEM IS REQUIRED FOR THE GATHERING OF AERODYNAMIC AND BALLISTIC TEST DATA AS AN AID IN THE DESIGN AND PERFORMANCE EVALUATION OF U.S. ARMY MUNITIONS. THE PROPOSAL FORMULATES A PLAN FOR THE ANALYSIS OF DESIGN OPTIONS AND THE ASSOCIATED COSTS AND ACCURACIES. IMPORTANT RADAR SYSTEM CON- FIGURATION PARAMETERS ARE SPECIFIED. METHODOLOGY FOR PREDICTING CONFIGURATION ACCURACY IS DESCRIBED. TWO CANDIDATE SIANGL/DATA PROCESSING ARCHIETECTURES OF VARYING COST AND ACCURACY ARE FORMULATED. KEY SIGNAL PROCESSING ALGORITHM PARAMETERS ARE IDENTIFIED. NONLINEAR FILTERING AND DATA ASSOCIATION ALGORITHMS ARE PROPOSED FOR BOTH REAL-TIME AND POST-MISSION ANALYSIS.

WAGNER D H ASSOCS INC
STATION SQUARE TWO
PAOLI, PA 19301
Program Manager: DR DAVID P KIERSTEAD SR
Contract #:
Title: DIGITAL FILTERING USING SIMULATION MODELS
Topic #: A90-084 Office: TECOM ID #: 39530

A VARIETY OF OBJECTS ARE TRACKED ON ARMY TEST RANGES, INCLUDING: SLOW-MOVING GROUND VEHICLES, HIGH PERFORMANCE AIRCRAFT, MISSILES, CANNON BULLETS, ORBITAL VEHICLES AND AIRBORNE DEBRIS. VIDEO AND RADAR SENSOR SYSTEMS SUPPORT TRACKING. ACCURATE, REAL TIME TRACKING IS CRITICAL IN SUPPORTING RANGE SAFETY CALCULATIONS AND PERFORMANCE EVALUATION. CURRENTLY OBJECTS ARE TRACKED USING POLYNOMIAL FILTERS (E.G. ALPHA-BETA FILTERS). POLYNOMIAL MODELS ARE USED BECAUSE THEY: ARE EASY TO CONSTRUCT, ARE COMPUTATIONALLY EFFICIENT, AND DO NOT REQUIRE DETAILED DESCRIPTIONS OF THE TARGET'S DYNAMICS. THE PRICE OF THIS SIMPLICITY IS THAT THEY RELY ON THE DATA TO CONTINUALLY CORRECT THE STATE ESTIMATE FOR UNMODELED EFFECTS. SINCE POLYNOMIAL FILTERS IGNORE SIGNIFICANT (AND KNOWN) DYNAMICS, THEY MUST BE MADE MORE RESPONSIVE TO CURRENT DATA (I.E. USE LARGER FILTER GAINS) THAN FILTERS BASED ON MORE ACCURATE MODELS. POLYNOMIAL FILTERS WILL BE CORRESPONDINGLY MORE RESPONSIVE TO NOISE IN THE DATA AS WELL. WE PROPOSE, IN PHASE I, TO IDENTIFY A LIMITED NUMBER OF GENERAL PURPOSE MOTION MODELS, BASED ON STOCHASTIC, DIFFERENTIAL EQUATIONS. WE WILL BUILD A SYSTEM FOR RAPIDLY SELECTING AND IMPLEMENTING FILTERS BASED ON THESE MODELS. WE WILL USE DATA COMPRESSION TECHNIQUES, AND THE MODIFIED EULER METHOD FOR SOLVING DIFFERENTIAL EQUATIONS NUMERICALLY, TO REDUCE THE COMPUTATIONAL LOAD.

BIO-IMAGING RESEARCH INC
425 BARCLAY BLVD
LINCOLNSHIRE, IL 60069
Program Manager: FRANCOIS ZAYEK
Contract #:
Title: HETERODYNE SHEARING INTERFEROMETRY FOR SURFACE PROFILE
Topic #: A90-085 Office: TECOM ID #: 39531

WE PROPOSE TO DEVELOP AND VERIFY IN THIS PHASE I PROGRAM A TECHNIQUE THAT WILL ACCURATELY AND REPEATABLY MEASURE SURFACE PROFILES AND DISTANCES BETWEEN A TEST OBJECT AND DETECTORS USING THE SHEARING HETERODYNE INTERFEROMETRY TECHNIQUE. THE TECHNIQUE IS BASED ON SHEARING HETERODYNE INTERFEROMETRY WITH A FREQUENCY MODULATED LASER DIODE USING THE FOUR-BUCKET-INTEGRATING TECHNIQUE. IT CAN BE USED TO DETERMINE DEPTH PROFILES VARYING FROM THE SUBMICRON TO CENTIMETER RANGE WITHOUT ANY CHANGE IN THE INSTRUMENT OR ITS COMPONENTS. IN PHASE II THIS TECHNIQUE CAN BE IMPLEMENTED INTO A COMPACT INSTRUMENT THAT WILL PRIMARILY BE USED TO MEASURE DEPTH PROFILES, BUT CAN ALSO BE USED TO MEASURE THE INNER

DIAMETER, THE OUT-OF-ROUND, AND THE TAPER OF A GUN BARREL. IN THE PROPOSED TECHNIQUE, THE INJECTION CURRENT OF THE LASER DIODE IS CONTINUOUSLY CHANGED TO INTRODUCE PHASE DIFFERENCES. A HIGH RESOLUTION CCD CAMERA WITH CORRECTED LINEARITY AND PIXEL-TO-PIXEL VARIATION IS USED FOR FRINGE DETECTION. THE MEASURED DATA IS STORED IN AN IBM PC WHICH WILL RUN SOFTWARE TO REDUCE NOISE AND INCREASE THE ACCURACY OF MEASUREMENTS. WE ANTICIPATED THAT THE ACCURACY AND REPEATABILITY OF THE MEASUREMENTS IN OUR LABORATORY WILL BE CLOSED TO ONE MICRON.

AUTOMATED PRECISION INC
7901-C CESSNA AVE
GAITHERSBURG, MD 20879
Program Manager: DR KAM C LAU
Contract #:
Title: A HIGH-SPEED LASER SCANNING IMPACT SCORING SYSTEM
Topic #: A90-086 Office: TECOM ID #: 39532

A PHASE I RESEARCH AND DEVELOPMENT PROJECT TO DESIGN THE EQUIPMENT AND ALGORITHMS TO MEASURE THE IMPACT POINTS OF DIRECT FIRED PROJECTILES ON A VERTICAL MATRIX OF 12.5 METERS BY 12.5 METERS TO A CENTROID ACCURACY OF 1 CENTIMETER AND ANGLE OF INCIDENCE TO AN ACCURACY OF 1 MILLIDEGREE IS PROPOSED. THE CONCEPTUAL DESIGN, THE KEY SUBSYSTEMS, THE OPERATION PROCEDURES AND THE MEASUREMENT ALGORITHMS ARE DESCRIBED. THE RESULTS OF PHASE I PROGRAM WILL PROVIDE THE DESIGN GUIDELINES FOR THE DEVELOPMENT OF A PROTOTYPE IMPACT SCORING SYSTEM IN PHASE II.

KMS FUSION INC
PO BOX 1567 - 700 KMS PL
ANN ARBOR, MI 48106
Program Manager: DR N KENT MONCUR
Contract #:
Title: HIGHLY VERSATILE HOLOGRAPHIC IMAGING SYSTEM FOR PLUME PARTICULATES (HISPP)
Topic #: A90-087 Office: TECOM ID #: 39533

ONE OF THE MAJOR PROBLEMS IN LASER-TARGET INTERACTION EXPERIMENTS IS THAT THE PARTICULATE MATERIAL EXPELLED IN THE PLUME SCATTERS THE LASER LIGHT OUT OF THE BEAM BEFORE IT IS ABSORBED. TO MEET THE ARMY'S NEEDS TO UNDERSTAND THIS PROCESS, KMS PROPOSES TO DEVELOP A HOLOGRAPHIC PLUME ANALYSIS SYSTEM THAT WILL CAPTURE IMAGES OF THE PLUME FOR DETAILED ANALYSIS. BASED ON ITS 16 YEARS EXPERIENCE IN LASER/MATERIALS INTERACTIONS IN THE INERTIAL CONFINEMENT FUSION PROGRAM, KMS WILL DEFINE A HIGHLY VERSATILE, HOLOGRAPHIC IMAGING SYSTEM FOR PLUME PARTICULATES (HISPP) THAT WILL PROVIDE (a) A DEEP FIELD HOLOGRAPHIC PLUME IMAGES THAT CAN BE ANALYZED FOR PARTICLE SIZE AND DISTRIBUTION, (b) TEMPORAL RESOLUTION WITH MULTIPLE HOLOGRAPHIC IMAGES AT VARIOUS STAGES OF PLUME DEVELOPMENT, (c) AUTOMATED ANALYSIS OF THE PLUME STRUCTURE ACCORDING TO PARTICULATE SIZE THROUGH THE USE OF AN EFFICIENT PARTICULATE ANALYZER SUBSYSTEM, AND (d) A HOLOGRAPHIC SYSTEM THAT IS VERSATILE BUT EASY TO INTEGRATE INTO THE USER EXPERIMENT. KMS WILL ALSO DEVISE AN EXPERIMENTAL PLAN (USING THE KMS CHROMA LASER SYSTEM AS A TEST BED) TO DEMONSTRATE HOLOGRAPHIC IMAGING OF PARTICULATES GENERATED IN LASER-TARGET INTERACTIONS AND TO RECONSTRUCT THE IMAGED HOLOGRAMS.

MATERIALS MODIFICATION INC (MMI)
PO BOX 4817
FALLS CHURCH, VA 22044
Program Manager: DR T S SRIVATSAN

Contract #:
Title: ACCELERATED CORROSION TESTING CHAMBER FOR WHEELED VEHICLES
Topic #: A90-088 Office: TECOM ID #: 39534

IN THIS PHASE I EFFORT, THE GOAL IS TO DETERMINE THE FEASIBILITY OF CONDUCTING ACCELERATED CORROSION TESTING OF VEHICLES BY SIMULATING 5-10-15 YEARS OF FIELD LIFE IN A COMPUTER CONTROLLED ENVIRONMENT SIMULATION CHAMBER. THE DIFFERENT REQUIREMENTS OF THE CHAMBER, THE TYPES OF ENVIRONMENTS PRESENT IN THE DIFFERENT GEOGRAPHICAL REGIONS, THE CORRELATION BETWEEN ACCELERATED CHAMBER TESTS AND FIELD CONDITIONS, THE ABILITY TO PROGRAM THE CONTROLLED ENVIRONMENTS, AND THE INCORPORATION OF CURRENT ARMY PROGRAMS RELATED TO CORROSION WILL BE INCORPORATED IN PHASE I. SUCCESSFUL COMPLETION OF PHASE I WOULD RESULT IN THE DESIGN AND TEST OF THE CHAMBER IN PHASE II.

COLUMBIA RESEARCH INSTRUMENTS CORP
506 LAUREL DR
COLUMBIA, MO 65203
Program Manager: MARK A PRELAS
Contract #:
Title: EFFICIENT COMPACT AND TUNEABLE MICROWAVE-DRIVEN UV SOLID-STATE LASERS
Topic #: A90-089 Office: BRL ID #: 39536

THIS PROJECT WILL ENCOMPASS THE DESIGN OF A COMPACT FIELD WORTHY ULTRAVIOLET LASER WITH A WEIGHT LESS THAN 100 lbs., A VOLUME LESS THAN 2 cu. ft., AND A PULSED ENERGY OUTPUT GREATER THAN 25 mJ. THE THE LASER WILL USE A NEW BREAKTHROUGH IN FLASHLAMP TECHNOLOGY WHICH CAN PROVIDE THE POWER NECESSARY TO DEVELOP A UV, POTENTIALLY TUNEABLE, FREQUENCY TRIPLED SOLID-STATE LASER. THIS LASER CONCEPT IS CAPABLE OF STEADY-STATE OPERATION AND CAN ACHIEVE 10-20 ns PULSES WITH NODE LOCKING TECHNIQUES AND WILL OPERATE AT 100 Hz OR BETTER. THE FLASHLAMP WILL USE MICROWAVE PUMPED FLUORESCERS WHICH HAVF PROPERTIES THAT ARE VERY COMPETITIVE WITH SEMICONDUCTOR PUMPING TECHNOLOGIES BUT ALSO HAVE THE ADVANTAGE OF OFFERING A BROAD RANGE OF PUMP FREQUENCIES. THESE FLUORESCER SOURCES CAN BE USED TO PUMP SEVERAL TYPES OF SOLID-STATE LASER MATERIALS INCLUDING SOME TUNEABLE MEDIA (E.G., GADOLINIUM SCANDIUM GALLIUM GARNET (GdScGa-GARNET), TITANIUM-APPHIRE (Ti:Al2O3) AND ALEXANDRITE (BeAl2O4)). FOR EXAMPLE, FLASHLAMP DRIVEN Ti:Al2O3 HAS DEMONSTRATED w1 EMISSION FROM 720 TO 920 mn AND THERE ARE ONGOING RESEARCH EFFORTS TO FREQUENCY DOUBLE AND TRIPLE TITANIUM-SAPPHIRE (w2 EMISSION FROM 360 TO 460 nm, AND w3 EMISSION FROM 240 TO 306.7 nm).

STABLELASE INC
1042 STAGECOACH RD
SANTA FE, NM 87501
Program Manager: ROBERT C SZE
Contract #:
Title: COMPACT AND FIELD-WORTHY ULTRAVIOLET LASER
Topic #: A90-089 Office: BRL ID #: 39535

IN PHASE I WE PROPOSE TO DESIGN, DEVELOP AND DELIVER TO THE BALLISTIC RESEARCH LABORTORY OF THE ARMY A COMPACT, LIGHT-WEIGHT LASER CAPABLE OF OPERATING AT XeCl, XeF, KrF, KrCl AND ArF WAVELENGTHS WITH A SIMPLE CHANGE IN GAS FILL AND WITHOUT THE NEED FOR PASSIVATION. IT WILL MEET THE ENERGY SPECIFICATIONS OF 25 mJ AND ArF AND OPERATIONS AT 100 Hz PULSE REPETITION FREQUENCY WITH STABLE RESONATOR OPTICS. CARE WILL BE PLACED ON MATERIALS COMPATIBILITY TO INSURE LONG GAS FILL LIFETIMES. THE DEVELOPMENT OF NEAR DIFFRACTION LIMITED BEAM OPTICS, GAS AND PARTICULATE CLEAN-UP SYSTEMS AS WELL AS PARTICULATE DEFLECTION SYSTEMS WILL BE LEFT TO PHASE II OF THIS DEVELOPMENT. DEPENDABILITY STUDIES OF THE LASER TO MAKE THE DEVICE

TRULY FIELD-WORTHY WILL ALSO TAKE PLACE IN PHASE II.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: DR IRVING OSOFSKY
Contract #:
Title: PENETRATION MEASUREMENT SYSTEM
Topic #: A90-090 Office: BRL ID #: 39537

WHEN METAL TARGETS ARE IMPACTED BY PROJECTILES, A CRATER PERFORATION OR THROUGH HOLE IS FORMED AND IT IS DESIREABLE TO MEASURE THE DEPTH OF THE ARCH, THE DIAMETER AND VOLUME OF THE CRATER AS A FUNCTION OF DEPTH. GENERALLY, THE LIPS OF THE CRATER WHICH ARE RAGGED, ARE ELEVATED ABOVE THE TARGET FACE AND THERE MAY BE PIECES OF THE FULL OR PARTIALLY BURIED PROJECTILE IN THE CRATER. SPARTA PROPOSES TO DEVELOP AND DEMONSTRATE A NOVEL, RAPID MEANS OF MEASURING CRATER GEOMETRY. THE APPROACH INVOLVES ULTRASONIC MEASUREMENTS IN A QUICK HARDENING "PLASTIC" COMPOUND CRATER FILLER. TRAVERSING ULTRASONIC HEAD WILL GENERATE A SONAR MAP OF A SLICE OF THE CRATER AND MULTIPLE SONAR ECHOES WILL DETERMINE THE CROSS SECTION AND LENGTH OF ANY PENETRATOR OR SPALL AS A FUNCTION OF CRATER LOCATION. THE DATA WOULD BE PROCESSED IN A PORTABLE COMPUTER WHICH WOULD DETERMINE CRATER CROSS SECTION AND VOLUME AUTOMATICALLY. THIS SYSTEM IS BASED ON EXPERIENCE BY THE AUTHOR ON THE MEASUREMENT OF CRATERS AND DAMAGE ON METALLIC AND NON METALLIC TARGETS UTILIZING ULTRASONIC GAGES IN CONJUNCTION WITH A QUICK SETTING CRATER FILLING COMPOUND. THE ACCURACY OF CRATER DEPTH MEASUREMENTS WILL BE IN ON THE ORDER OF 0.001 INCHES (0.0254 mm) WITH POSITIONING ACCURACY BEING A FUNCTION OF THE POSITIONING MECHANISM.

KLEIN ASSOCS INC
PO BOX 264 - 800 LIVERMORE ST
YELLOW SPRINGS, OH 45387
Program Manager: DR GARY A KLEIN
Contract #:
Title: CASE-BASED SELECTION OF ALLOCATION METHODS
Topic #: A90-091 Office: BRL ID #: 39538

THE OBJECTIVE IS TO DEVELOP A CASE-BASED REASONING (CBR) SYSTEM FOR DETERMINING THE ALLOCATION METHODS USED BY FIRE DIRECTION OFFICERS. CASE-BASED REASONING IS A NEW APPROACH TO EXPERT SYSTEMS; COMPARED TO RULE-BASED SYSTEMS, CBR APPEARS TO BE A MORE EFFICIENT, SENSITIVE, AND EFFECTIVE STRATEGY TO DERIVE AND REPRESENT CRITICAL KNOWLEDGE. PHASE I WILL DEMONSTRATE THE FEASIBILITY OF A CBR APPROACH THAT USES TACTICAL FIRE CONTROL DECISION DATA FROM PREVIOUS EXERCISES AS THE BASIS FOR PREDICTIONS. STANDARD ARTIFICIAL INTELLIGENCE (AI) APPROACHES RUN INTO THE DIFFICULTY OF HAVING TO MODEL THE COMPLEXITIES OF THE HARDWARE/SOFTWARE ELEMENTS ALONG WITH THE COMPLEXITIES OF THE HUMAN FACTORS. A CBR STRATEGY AVOID THIS PROBLEM BY RELYING ON MATCHES TO SIMILAR PROJECTS SO THAT IT IS NOT NECESSARY TO REPRESENT WORLD KNOWLEDGE. ADDITIONALLY, A CBR APPROACH OFFERS THE POSSIBILITY OF IMPROVING REAL-TIME PERFORMANCE CONSIDERABLY, SINCE A SIMILAR CASE REPRESENTING A NEAR SOLUTION CAN BE RETRIEVED RAPIDLY.

SIGCOM INC
408 OAKBROOK CIR
URBANA, IL 61801
Program Manager: H RUSSELL & M PURSLEY

Contract #:
Title: SIDE INFORMATION IN SPREAD-SPECTRUM PACKET RADIO NETWORKS
Topic #: A90-092 Office: ARO ID #: 39539

RELIABLE DATA DISTRIBUTION WITHIN SPREAD-SPECTRUM PACKET RADIO NETWORKS REQUIRES HIGH PERFORMANCE FROM THE LINKS AND AS WELL AS FROM THE NETWORK PROTOCOLS. SIDE INFORMATION CAN BE EXTRACTED FROM RECEIVED SIGNALS THAT ARE EMBEDDED IN NOISE AND INTERFERENCE, AND THIS INFORMATION CAN BE USED TO IMPROVE THE QUALITY OF THE LINKS AND TO AID THE NETWORK PROTOCOLS IN ESTABLISHING RELIABLE ROUTES THROUGHOUT THE NETWORK. THE PROPOSED PROJECT INVOLVES THE DESIGN, DEVELOPMENT, AND EVALUATION OF PERFORMANCE OF TECHNIQUES AND ALGORITHMS FOR DEVELOPING SIDE INFORMATION AND USING IT EFFECTIVELY TO AID LINK AND NETWORK PERFORMANCE IN SPREAD-SPECTRUM PACKET RADIO NETWORKS. THE GOAL IS TO IMPROVE FREQUENCY-HOP PACKET RADIO NETWORK PERFORMANCE BY INCORPORATING NEW METHODS FOR OBTAINING AND USING SIDE INFORMATION IN THE RECEPTION OF SIGNALS AND IN THE ROUTING OF PACKETS THROUGH THE NETWORK.

E-TEK DYNAMICS INC
1885 LUNDY AVE
SAN JOSE, CA 95131
Program Manager: J J PAN
Contract #:
Title: OPTICAL TECHNIQUES FOR THE CONTROL AND DATA PROCESSING OF MICROWAVE AND MILLIMETER ARRAYS
Topic #: A90-093 Office: ARO ID #: 39540

OPTICALLY BASED RF PHASE DISTRIBUTION AND CONTROL TECHNIQUES FOR MICROWAVE AND MILLIMETER-WAVE PHASED-ARRAY SYSTEMS PROVIDE THE ADVANTAGES OF COST EFFECTIVENESS, SYSTEM SIMPLICITY, RAPID PARALLEL PROCESSING, LOW INTERFERENCE, HIGH RADIATION RESISTANCE, AND EFFICIENT 3-D CONNECTIONS. E-TEK WILL INVESTIGATE, ANALYZE, AND DESIGN, AND OPTIMIXE: (1) A PRECISE MICROWAVE RF PHASE TRANSMISSION AND DISTRIBUTION SYSTEM EMPLOYING AN INNOVATIVE FIBER OPTIC LINK, WITH PHASING ACCURACY OF BETTER THAN 2 DEGREE; (2) VARIOUS OPTICAL BEAM FORM/STEERING TECHNIQUES, INCLUDING OPTICAL CROSSBAR BEAM FORMER (BF), PARTIAL-SUM BF, VECTOR-MATRIX FREQUENCY DOMAIN BF, AND PROGRAMMABLE IMAGE/HOLOGRAPHIC 21 GHz PHASED-ARRAY IN PHASE I. THE DETAILED DESIGNS OF THE COMPONENTS/DEVICES CAN DIRECTLY LEAD TO PHASE II HARDWARE FABRICATION, VERIFICATION, AND DEMONSTRATION. AT PRESENT, E-TEK HAS 21 GHz FIBER OPTIC LINK, PHASE SHIFTERS, LOW COST 1xN FIBER DISTRIBUTION COUPLERS, INTEGRATED OPTIC SWITCHES, ETC., TO PRACTICALLY IMPLEMENT THE OPTICALLY CONTROLLED PHASED-ARRAYS WITH ARRAY ELEMENTS OF 1,000 TO 10,000.

FTR ASSOCIATES
54 BROAD ST - STE 224
RED BANK, NJ 07701
Program Manager: H JAMGOTCHIAN
Contract #:
Title: A HIGH-SPEED MULTISPECTRA INFRARED VIDEO SYSTEM TO MEASURE THE REACTION FRONT OF SOLID PROPELLANTS
Topic #: A90-094 Office: ARO ID #: 39541

IT IS PROPOSED TO DEVELOP A NEW HIGH-SPEED MULTISPECTRA INFRARED (MS-IR) VIDEO SYSTEM EQUIPPED WITH MULTIPLE FOCAL PLANE DETECTOR ARRAYS (FPDA) SUPPORTED BY NEW HIGH-PERFORMANCE ELECTRONIC DRIVING CIRCUITS AND OUR SOFTWARE IN ORDER TO MEASURE THE REACTION FRONT OF SOLID PROPELLANTS. THE NEW MS-IR SYSTEM WILL MEASURE THE IR EMISSION IMAGE OF THE REACTION FRONT THROUGH FOUR WAVEBANDS TO DETERMINE THE INSTANTANEOUS

DISTRIBUTIONS OF SURFACE TEMPERATURE AND GASEOUS SPECIES GENERATED DURING IGNITION DELAY AND REACTION PERIODS. THE DEVELOPMENT OF THE NEW MS-IR SYSTEM WILL BE ACHIEVED BY EXTENDING WHAT HAS BEEN DEVELOPED BY OUR TEAM OF SPECIALISTS, NAMELY A COMBUSTION ENGINEER, A CAMERA HEAD DESIGNER, TWO ELECTRONICS ENGINEERS AND A CRYOGENIC SYSTEM DESIGN ENGINEER. THE NEW HIGH-SPEED MS-IR SYSTEM WILL BE DEVELOPED TO HAVE SEVERAL TARGET FEATURES INCLUDING, A VARIABLE FRAME RATE (FOR A RATE UP TO SEVERAL THOUSAND FRAMES/SEC); A VARIABLE ELECTRONIC-SHUTTER (FOR AN EXPOSURE TIME OF ABOUT 250 NANOSECONDS); AND THE SPATIAL RESOLUTION (OF SEVERAL MICROMETERS) FOR THE REACTION FRONT TO BE INVESTIGATED, WHICH ARE ACHIEVED AS MUCH AS ALLOWED BY THE LIMITS OF MODERN ELECTRO-OPTICAL TECHNOLOGY.

ADA TECHNOLOGIES INC
304 INVERNESS WAY S - STE 110
ENGLEWOOD, CO 80112
Program Manager: DR CYNTHIA L BENNER
Contract #:
Title: DEVELOPMENT OF A PORTABLE FAST RESPONSE TRACER ANALYSIS SYSTEM FOR CONCENTRATION FLUCTUATION MEASUREMENTS
Topic #: A90-095 Office: ARO ID #: 39542

CONCENTRATION FLUCTUATION MEASUREMENTS OF A TRACER GAS CAN PROVIDE INFORMATION REGARDING THE DISPERSION AND TRANSPORT OF AN AIR MASS. THERE HAS BEEN A DEARTH OF SUCH DATA BECAUSE OF A SHORTAGE OF INEXPENSIVE, SIMPLE-TO-OPERATE INSTRUMENTATION MEETING THE NECESSARY REQUIREMENTS OF FAST RESPONSE, HIGH SENSITIVITY, AND STABILITY. IT IS THE GOAL OF THIS RESEARCH PROGRAM TO DEVELOP AN INEXPENSIVE, HIGHLY SENSITIVE, AND FAST RESPONSE REAL-TIME TRACER ANALYSIS SYSTEM WHICH WOULD MAKE MULTIPLE-POINT CONCENTRATION FLUCTUATION MONITORING PRACTICAL. THE PROPOSED ANALYSIS SYSTEM CONSISTS OF A SAMPLE HEAD, WHICH DRAWS IN THE AIR SAMPLE AND DETECTS THE TRACER GAS; AND A SEPARATE ELECTRONICS PACKAGE, WHICH PROVIDES THE POWER FOR THE DETECTOR. A PROTOTYPE SYSTEM WILL BE DESIGNED, FABRICATED, AND COMPLETELY TESTED IN THE LABORATORY. FOLLOWING THE LABORATORY EVALUATION, THE SYSTEM WILL BE MODIFIED AS NECESSARY TO PREPARE THE SYSTEM FOR FIELD USE. ONE IMPORTANT MODIFICATION WILL BE THE REDESIGN OF THE SMAPLE HEAD SO THAT IT MINIMALLY AFFECTS THE FLOW OF AIR CONTAINING THE TRACER GAS. EXTERNAL POWER WILL NOT BE REQUIRED FOR THIS SYSTEM, THE SYSTEM WILL MAINTAIN A CONSTANT CALIBRATION FOR AT LEAST 90 MINUTES,AND FIELD CALIBRATION WILL BE SIMPLE.

E-TEK DYNAMICS INC
1885 LUNDY AVE
SAN JOSE, CA 95131
Program Manager: S C LIN
Contract #:
Title: InGaAs/InP AlGaAs/GaAs SUPERLATTICES OPTICAL WAVEGUIDE BY ION-INDUCED DISORDERING
Topic #: A90-096 Office: ARO ID #: 39543

ION-INDUCED DISORDERING (IID) OF SUPERLATTICES AND MULTIPLE QUANTUM WELLS STRUCTURES IS GOING TO IMPACT ELECTRONICS, PHOTONICS, AND OEIC TECHNOLOGIES. IN THIS PROGRAM, E-TEK PROPOSES TO INVESTIGATE LOW LOSS IID AlGaAs/GaAs, InGaAs/InP OPTICAL WAVEGUIDES AT WAVELENGTHS OF 0.8um, 1.3um, AND 1.5um. OUR PREVIOUS WORK HAS ESTABLISHED PROVEN TECHNOLOGIES IN ACHIEVING IID OF THESE STRUCTURES. IN THIS PHASE I R&D TASK, WAVEGUIDE CHARACTERISTICS SUCH AS PROPAGATION LOSS, MODE PROFILE, AND ACCESS LOSS DUE TO IID WILL BE EMPHASIZED. LOW LOSS IID WAVEGUIDE WILL BE INVESTIGATED USING THE TECHNIQUE OF RAPID THERMAL ANNEALING WHICH HAS BEEN PROVEN TO BRING BACK THE PHOTOLUMINESCENCE OF IMPLANTED SUPERLATTICE IN OUR PREVIOUS IID EXPERIMENTS. THE RESULTS OF PHASE I R&D CAN BE DIRECTLY APPLIED TO IID DIODE

LASERS, IID WAVEGUIDE MODULATORS, IID OPTICAL SWITCHES, AND IID OEIC IN THE PHASE II TASK.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
Program Manager: HAROLD L GRUBIN
Contract #:
Title: DESIGN AND DEVELOPMENT OF LOW NOISE HIGH SPEED HIGH ELECTRON MOBILITY TRANSISTORS (HEMT)
Topic #: A90-097 Office: ARO ID #: 39544

THIS PROPOSAL DISCUSSES A PROGRAM TO DESIGN AND DEVELOP LOW NOISE, HIGH SPEED HIGH ELECTRON MOBILITY TRANSISTORS (HEMT). THE MATERIAL SYSTEM WILL BE InAlAs/InGaAs ON InP AS THIS TECHNOLOGY PROMISES TO BE THE VEHICLE FOR HIGH SPEED INTEGRATED CIRCUITS. THE OBJECTIVE OF THE PROGRAM IS TO DESIGN THE DEVICES SUCH THAT THEY CAN BE FABRICATED AT LOW COST. THIS WILL BE ACCOMPLISHED THROUGH OPTIMIZATION USING NUMERICAL SIMULATION, PRIOR TO FABRICATION. IN ADDITION, WHEN COST EFFECTIVE PROCESS MODIFICATIONS ARE MADE, THEIR EFFECTS WILL BE FIRST STUDIED USING SIMULATION IN ORDER TO REDUCE THE COSTLY ITERATIONS. THE SIMULATION WILL BE CARRIED OUT USING A SUCCESSFUL MODEL PREVIOUSLY USED FOR HETEROSTRUCTURE DEVICES AND THE PERMEABLE BASE TRANSISTORS.

SPECTRAL SCIENCES INC
99 S BEDFORD ST - #7
BURLINGTON, MA 01803
Program Manager: MEHTAB M PERVAIZ
Contract #:
Title: A STRATEGY COMBINING REGIONALLY ADAPTED PROCESSES (SCRAP)
Topic #: A90-098 Office: ARO ID #: 39545

A STRATEGY COMBINING REGIONALLY ADAPTED PROCEESSES (SCRAP) IS PROPOSED FOR SIMULATING TRANSONIC OR SUPERSONIC FLOW OVER PHYSICALLY AND GEOMETRICALLY COMPLEX FINNED MISSILE CONFIGURATIONS. FLOW FIELDS OFTEN INCLUDE SUBDOMAINS DOMINATED BY DIFFERENT PHYSICAL PROCESSES. A TECHNIQUE IS PROPOSED IN WHICH EACH ZONE HAS AN ASSOCIATED NUMERICAL SCHEME AND COULD BE SUBJECT TO AUTOMATIC LOCAL EMBEDDING. THIS METHOD WILL ALLEVIATE THE NEED FOR A SINGLE GRID AND CONCENTRATE RESOURCES IN MODELING COMPLEX PHYSICS ONLY AN IMPORTANT REGIONS. PHASE I OBJECTIVES INCLUDE IMPLEMENTING SOLVERS, DEVELOPING DATA MANAGEMENT SYSTEM, SPECIFYING ZONAL INTERFACE CONDITIONS, AND ASESSING THE POTENTIAL OF THE TECHNIQUE. THIS PROJECT WILL RESULT IN AN ANALYSIS TOOL THAT WILL CARRY OUT FLOW SIMULATIONS FOR COMPLEX AND IRREGULAR FIN GEOMETRIES WITH CRUDE AERODYNAMIC SHAPES AND LARGE ATTACK ANGLES. SUCH SIMULATIONS OFTEN INVOLVE PHYSICALLY COMPLEX CONDITIONS OF FLOW SEPARATION, RECIRCULATION AND INTERACTIONS OF SHOCK WAVES. THE SCRAP SCHEME WILL MORE ACCURATELY PREDICT THE RESULTANT FORCES AND MOMENTS ON PRACTICAL FIN GEOMETRIES. IT WILL ALSO SIGNIFICANTLY REDUCE COMPUTATIONAL REQUIREMENTS OF CPU TIME AND STORAGE AND AT THE SAME TIME WILL BE COMPARATIVELY MORE ACCURATE THAN THE CONVENTIONAL SCHEMES. THIS WILL LED TO AN ACCURATE COMPUTATION OF THE TRAJECTORIES AND BETTER DESIGN FOR GUIDED PROJECTILES.

ADVANCED COUNTER-MEASURE SYSTEMS
9838 OLD PLACERVILLE RD
SACRAMENTO, CA 95827
Program Manager: DEAN W MINSTER

Contract #:
Title: PROPERTY RESTORAL ALGORITHMS FOR BLIND ADAPTATION OF RECEIVE-PATH & TRANSMIT-PATH ANTENNA ARRAYS IN GROUND-BASED COMMUNICATION SYSTEM
Topic #: A90-099 Office: ARO ID #: 39546

AN SBIR PROJECT IS PROPOSED HERE TO DEVELOP NOVEL TECHNIQUES FOR DIRECTIVE/RETRODIRECTIVE COMMUNICATIONS, BY USING BLIND ADAPTATION ALGORITHMS TO ADJUST THE ARRAY WEIGHT ON THE RECEIVE/TRANSMIT PATHS OF A COMMUNICATION SYSTEM. THE PROPOSED PROCESSOR HAS THE CAPABILITY TO AUTOMATICALLY EXTRACT SIGNALS FROMTHE RECEIVED ENVIRONMENT, AND TO TRANSMIT SIGNALS BACK TO THE SIGNAL SOURCE USING AN ANTENNA PATTERN THAT IS EITHER MAXIMALLY DIRECTED TOWARDS THE COMMUNICATION SOURCE (DIRECTIVE MODE), OR DIRECTED TOWARDS THE COMMUNICATOR AND AWAY FROM THE OTHER EMITTERS IN THE ENVIRONMENT (RETRODIRECTIVE MODE). THE PROCESSOR IS ABLE TO ACCOMPLISH THIS ADAPTATION WITHOUT THE NEED FOR SPECIAL-PURPOSE ANTENNAS, SPECIAL SENSOR GEOMETRIES, OR RECEIVER CALIBRATION DATA TO SET THE RECEPTION OR TRANSMISSION ARRAYS. THE OBJECTIVE OF THIS SBIR PROJECT IS TO DEMONSTRATE THE UTILITY OF BLIND DIRECTIVE/RETRODIRECTIVE COMMUNICATIONS FOR A GROUND-BASED TACTICAL COMMUNICATION SYSTEM. THE TECHNIQUE DEVELOPMENT AND EVALUATION WILL DETERMINE THE PERFORMANCE OF THE SYSTEM CONFIGURATIONS UNDER REALISTIC CONDITIONS, USING COMPUTER SIMULATIONS. THE EVALUATION WILL ALSO INCLUDE AN ASSESSMENT OF THE COST AND PERFORMANCE TRADE-OFFS IN THE OVERALL SYSTEM. A GOAL OF THIS DEVELOPMENT IS TO ACCOMPLISH ADAPTATION QUICKLY ENOUGH TO ALLOW THE ANTENNA ARRAY TO BE USEED IN CONJUNCTION WITH FH MODULATION FORMATS.

OPHIR CORP
3190 S WADSWORTH BLVD - STE 100
LAKEWOOD, CO 80227
Program Manager: DR LOREN D NELSON
Contract #:
Title: MICROWAVE RADIOMETER FOR NOWCASTING ATMOSPHERIC TEMPERATURE PROFILES
Topic #: A90-100 Office: ASL ID #: 39547

WE PROPOSE A MULTI-CHANNEL MILLIMETER-WAVE RADIOMETER FOR MEASURING ATMOSPHERIC TEMPERATURE PROFILES AND INVERSIONS WITHOUT RESORT TO RADIOSONDE OBSERVATION. THE DEVICE WILL UTILIZE MULTIPLE PASSIVE CHANNELS AT 23,31, AND 50-60 GHz. THIS RADIOMETER DEVELOPMENT TO MEASURE ATMOSPHERIC TEMPERATURE IS A LOGICAL EXTENSION OF OUR ALREADY EXISTING AND COMMERCIALLY AVAILABLE 23/31 GHzWATER VAPOR RADIOMETER. THE PROPOSED DEVICE WILL CONTINUOUSLY MEASURE WATER VAPOR, CLOUD LIQUID WATER AND TEMPERATURE STRUCTURE IN THE ATMOSPHERE FROM A LIGHT-WEIGHT PORTABLE PLATFORM.

SENTEC CORP
920 E LINCOLN
BIRMINGHAM, MI 48009
Program Manager: TAKEO SAWATARI
Contract #:
Title: INEXPENSIVE OPTICAL SENSOR FOR AEROSOL ANALYSIS
Topic #: A90-101 Office: ASL ID #: 39548

THE DEVELOPMENT OF AN INEXPENSIVE AEROSOL SENSOR WHICH RAPIDLY QUANTIFIES THE SIZE AND DENSITY OF SUSPENDED PARTICLES IN AIR AS A FUNCTION OF ALTITUDE IS PROPOED FOR A90-101. THE DEVICE IS SMALL (12" x 2" x 1") AND REQUIRES MINIMUM MAINTENANCE. THE DEVICE USES TWO LASER BEAMS (LASER DIODE) TO ILLUMINATE THE VERTICAL COLUMN OF AIR TO CAUSEE LIGHT SCATTERING OFF THE PARTICLES. THE SCATTERED LIGHT FROM EACH VOLUME EELEMENT IN THE COLUMN IS THEN MEASURED WITH A UNIQUE OPTICAL SCANNING SYSTEM. DATA AREE TRANSMITTED TO AN ANALYSIS

STATION WHEERE A COMPUTER CALCULATES THE PARTICLE AVERAGE SIZE, THE PARTICLES NUMERICAL DENSITY AND THE HEIGHT ABOVE GROUND. THE SPECIAL FEATURE OF THE DEVICE IS THAT SUCH SENSORS CAN COMMUNICATE WITH EACH OTHER TO THE POINT WHERE ON COMMAND THE INTERROGATION BEAM OF ONE SENSOR CAN READ THE SIGNALS COMING FROM THE PRIMARY BEAM OF A NEIGHBORING SENSOR. THIS FEATURE OF THE SENSOR IS VERY USEFUL FOR BATTLEFIELD APPLICATIONS WHERE A SENSOR MAY SUSTAIN PARTIAL DAMAGE.

ADVANCED PROJECTS RESEARCH INC (APRI)
5301 N COMMERCE AVE - STE A
MOORPARK, CA 93021
Program Manager: DR DARRELL W PEPPER
Contract #:
Title: A MESOSCALE MODEL FOR PREDICTING PRECIPITATION AND CLOUD COVER
Topic #: A90-102 Office: ASL ID #: 39549

A MULTI-DIMENSIONAL NUMERICAL MODEL FOR PREDICTING CLOUD COVER, FOG, AND HAZE UNDER BATTLEFIELD CONDITIONS IS DEVELOPED. THE PROGRAM UTILIZES REAL TIME METEOROLOGICAL DATA (WHEN AVAILABLE) TO PREDICT METEOROLOGICAL CONDITIONS OVER IRREGULAR TERRAIN. THE COMPUTER PROGRAM IS RELATIVELY SIMPLE AND EXECUTES QUICKLY ON A VARIETY OF COMPUTER SYSTEMS. PROBLEMS REQUIRING SEVERAL THOUSAND NODES CAN BE SOLVED ON A PERSONAL COMPUTER. THE NUMERICAL MODEL SOLVES THE REDUCED FORM OF THE 3-D GOVERNING EQUATIONS FOR ATMOSPHERIC MOTION IN TERRAIN FOLLOWING COORDINATES. PARTICULATE SEEDING OF THE PROBLEM DOMAIN (BATTLEFIELD) CAN BE SIMULATED TO ASCERTAIN THE EFFECTS OF DISSIPATING (OR ENHANCING) THE FORMATION OF FOG AND HAZE.

PHOTON RESEARCH ASSOCS INC
9393 TOWNE CENTRE DR - STE 200
SAN DIEGO, CA 92121
Program Manager: WILLIAM M CORNETTE
Contract #:
Title: MODELING ATMOSPHERIC EFFECTS ON THERMAL CLUTTER
Topic #: A90-103 Office: ASL ID #: 39550

PRA PROPOSES TO DEVELOP AN EFFICIENT, FLEXIBLE SOFTWARE PACKAGE FOR EVALUATING REPRESENTATIONS OF BACKGROUND CLUTTER, TOGETHER WITH REALISTIC ATMOSPHERIC VARIABILITY. THIS MODEL WILL USE A COMBINATION OF EXISTING BACKGROUND DATA BASES AND ALGORITHMS, COMBINED WITH NEW INNOVATIVE APPROACHES TOWARD (i) THE MODELING OF RADIATIVE LOADING, (ii) FORWARD SCATTERING INTO THE SENSOR APERTURE, AND (iii) THE TEMPORAL AND SPATIAL ATMOSPHERIC CHARACTERISTICS. PRA'S EXPERIENCE AND EXPERTISE IN WORKING WITH BACKGROUND CLUTTER DATA BASES AND VARIOUS CHARACTERIZATIONS INSURES THAT THE MODEL WILL CONTAIN THE COMBINATION OF PHENOMENOLOGY AND EMPIRICISM NECESSARY TO REPRESENT THE THERMAL CLUTTER APPROPRIATELY.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: DR MARK A DRUY
Contract #:
Title: HIGH ENERGY DENSITY MOLECULAR COMPOSITE CAPACITOR FILM
Topic #: A90-104 Office: ETDL ID #: 39551

STATE-OF-THE-ART HIGH ENERGY CAPACITOR TECHNOLOGY IS APPROACHING 3 kJ/kG, BUT IT WILL TAKE

A MATERIALS BREAKTHROUGH TO REACH BEYOND THIS GOAL. A MOLECULAR COMPOSITE CONSISTING OF A NEW POLYMER AND/OR BLEND/COPOLYMERS THAT WILL BE SPECIFICALLY TAILORED TO RESIST HIGH VOLTAGE BREAKDOWN AND TO INCREASE DIELECTRIC CONSTANT CAN BE THAT MATERIAL. THE PROPOSED PHASE I PROGRAM WILL CREATE THIS NEW MOLECULAR COMPOSITE USING A POWERFUL COMPUTER MODELING PROGRAM DEVELOPED AT THE UNIVERSITY OF LOWELL. THIS MOLECULAR COMPOSITE WILL BE SYNTHESIZED AND MADE INTO FILM USING ADVANCED FILM PROCESSING TECHNIQUES ALREADY DEVELOPED AND PROVEN ON OTHER PROGRAMS. THIS FILM WILL BE TESTED AND EVALUATED BY ONE OF THE WORLD LEADERS IN HIGH POWER CAPACITOR FABRICATOR, MAXWELL LABORATORIES. A SUCCESSFUL TEST AT MAXWELL WILL FORM THE BASIS OF A PHASE II PROGRAM THAT WILL OPTIMIZE THE NEW MOLECULAR COMPOSITE FILM AND THOROUGHLY TEST AND CHARACTERIZE IT. PROTOTYPE CAPACITORS WILL THEN BE FABRICATED AND TESTED BY MAXWELL.

NORTHEAST SEMICONDUCTOR INC
95 BROWN RD - STE 141
ITHACA, NY 07703
Program Manager: LARRY W KAPITAN
Contract #:
Title: 10 MICRON INFRARED PHOTOTRANSISTOR
Topic #: A90-105 Office: ETDL ID #: 39552

A NEW PHOTODETECTOR FOR 10 um WAVELENGTHS IS PROPOSED WHICH CONSISTS OF GaAs/AlGaAs QUANTUM WELLS INCORPORATED INTO A pnp AlGaAs PHOTOTRANSISTOR. BY APPROPRIATE ENGINEERING OF THE EPITAXIAL STRUCTURE, OPTICAL GAINS OF ~100 SHOULD BE FEASIBLE IN THE PROPOSED DETECTOR. THE DEVICE SHOULD EXHIBIT RESPONSIVITIES AND SPECIFIC DETECTIVITIES (D*) WHICH ARE SUPERIOR TO THOSE OF HgCdTe PHOTOVOLTAIC DETECTORS. THIS PHASE I PROJECT WILL INCLUDE DEVICE MODELLING AND DESIGN, GROWTH BY MOLECULAR BEAM EPITAXY AND FABRICATION OF WORKING DEVICES, AND DEVICE CHARACTERIZATION AT 10 um WAVELENGTHS.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 260263
DENVER, CO 80226
Program Manager: DALE STEFFEN
Contract #:
Title: INTEGRATED CIRCUIT DEVICE PACKAGING PROTECTION AGAINST HIGH POWER MICROWAVE DIRECTED ENERGY WEAPONS
Topic #: A90-106 Office: ETDL ID #: 39553

HIGH POWER MICROWAVE (HPM) DIRECTED ENERGY WEAPONS POSE A THREAT TO SYSTEMS WHICH EMPLOY ADVANCED INTEGRATED CIRCUITS (VLSI/VHSIC). THESE CIRCUITS, WHICH USE SMALL GEOMETRY DEVICES, ARE SUSCEPTIBLE TO UPSET AND DAMAGE DUE TO THE LARGE CURRENTS AND VOLTAGES WHICH COUPLE TO THE PRINTED CIRCUIT BOARDS FROM HPM SOURCES. ELECTROSTATIC DISCHARGE PROTECTION IS INADEQUATE FOR THE REPETITIVE PULSE NATURE OF THE HPM THREAT, AND EXISTING TERMINAL PROTECTION DEVICES ARE TOO BULKY TO BE INCORPORATED INTO THE IC PACKAGES. THIS PROPOSAL ADDRESSES THE PROBLEM OF HARDENING THE PACKAGES THROUGH USE OF MICROWAVE FILTERING WITH FERRITE MATERIALS AND MICROWAVE TRANSMISSION LINES, AS WELL AS THE USE OF METALIZED DIELECTRIC COATINGS. THE APPROACH IS TO COMBINE MULTIPLE APPROACHES FOR HARDENING TO ACHIEVE INCRESED ATTENUATION AND PROTECT AGAINST A BROADER HAND OF FREQUENCIES. THREE DIMENSIONAL FINITE DIFFERENCE MODELING OF THE PRINTED CIRCUIT BOARDS AND IC PACKAGE WILL BE USED TO DETERMINE THREAT LEVELS AT THE CHIP INPUTS AND TO DETERMINE THE EFFECTIVENESS OF THE PROTECTION MEASURES.

PREDICTION SYSTEMS INC
200 ATLANTIC AVE
MANASQUAN, NJ 08736
Program Manager: KENNETH T IRVINE
Contract #:
Title: MULTI-BEAM PHASED-ARRAY SENSOR FOR TANK DEFENSE
Topic #: A90-107 Office: ETDL ID #: 39554

TO SUPPORT THE DEVELOPMENT OF TANK DEFENSE SYSTEMS, MULTI-BEAM PHASED ARRAY SENSORS FOR THE DETECTION AND TRACKING OF HOSTILE PROJECTILES ARE BEING ANALYZED. AN ENVIRONMENT WHERE SUCH SENSORS MAY BE TESTED AT LOW-COST IS DESIRED. SUCH AN ENVIRONMENT CAN BE PROVIDED THROUGH THE USE OF MODELING AND SIMULATION, COMBINED WITH THE DEMONSTRATION OF A HARDWARE PROTOTYPE. FOR THIS PHASE I TASK, A SIMULATION ENVIRONMENT THAT CAN BE USED TO SUPPORT SENSOR DEVELOPMENT TO ENHANCE ARMORED VEICLE SURVIVABILITY WILL BE DEMONSTRATED. SENSORS MODELS WILL MEASURE THEIR EFFECTIVENESS IN PROTECTING TANKS AGAINST HOSTILE WEAPONS. MULTIPLE SIMULATIONS CAN BE PERFORMED TO DETERMINE SENSOR LOCATION TO PROVIDE SUFFICIENT COVERAGE. GRAPHICS WILL BE USED TO DISPLAY IN SLOW MOTION THE ACTIVITY IN EACH BEAM OF THE ARRAY SENSOR. THIS SENSOR IS PROPOSED WITH AN INNOVATIVE CONCEPT FOR AN ELECTRONIC BEAM SCAN, AND MULTI-BEAM RECEIVER CONSTRUCTION AND SIGNAL PROCESSING. WE WILL DEMONSTRATE AN ENVIRONMENT IN WHICH SENSOR EFFECTIVENESS CAN BE TESTED AND EVALUATED, AS WELL AS A HARDWARE DEMONSTRATION OF A SINGLE-BEAM PSEUDO-RANDOM-CODED WAVEFORM RADAR AT 60 GHz TO ILLUSTRATE PROOF OF CONCEPT.

QUANTUM MAGNETICS
11578 SORRENTO VALLEY RD - STE 30
SAN DIEGO, CA 92121
Program Manager: DR ANDREW HIBBS
Contract #:
Title: NEW TYPE OF ULTRA-SENSITIVE MAGNETOMETER MADE FROM HIGH Tc THIN FILM
Topic #: A90-108 Office: ETDL ID #: 39555

WE PROPOSE TO FABRICATE A NEW TYPE OF SOLID STATE MAGNETIC FIELD TO VOLTAGE TRANSDUCER FROM THIN-FILMS OF THE HIGH-Tc SUPERCONDUCTOR Bi2, Ca2Sr2Cu3Ox (BSCCO). WE BELIEVE THAT WHEN OPERATING AT 80K - 100K, THIS DEVICE WILL HAVE A SENSITIVITY BETTER THAN STATE OF THE ART OPTICALLY PUMPED MAGNETOMETERS. IN PHASE I, WE WILL DEPOSIT THIN FILMS OF BSCCO, FABRIATE SIMPLE TEST STRUCTURES AND MEASURE AND FULLY CHARACTERIZE THE ELECTRICAL PROPERTIES RELEVANT FOR THE NEW SENSOR. WE WILL ALSO ESTIMATE THE SENSITIVITY OF A COMPLETE OPTIMIZED SENSOR TO BE BUILT IN PHASE II.

TFR TECHNOLOGIES INC
2601 OAKWOOD RD
AMES, IA 50010
Program Manager: KENNETH LAKIN
Contract #:
Title: THIN FILM RESONATOR MICROWAVE-ACOUSTIC FILTERS
Topic #: A90-109 Office: ETDL ID #: 39556

THE THIN FILM RESONATOR (TFR) TECHNOLOGY EMBODIES A BROAD CLASS OF FREQUENCY SELECTIVE DEVICES OFFERING SIGNIFICANT SIZE AND PERFORMNCE BENEFITS OVER OTHER EXISTING TECHNOLOGIES. TFR'S CAN BE MONOLITHI- CALLY INTEGRATED WITH CTIVE DEVICES TO ENABLE HIGH LEVELS OF RF SUBSYSTEM INTEGRATION AND FUNCTIONALITY. AREA, VOLUME,AND FABRICATION REQUIREMENTS OF OTHER FILTERING TECHNOLOGIES LIMIT THE OVERALL SYSTEM SIZE REDUCTIONS OBTAINABLE THROUGH THE HIGH LEVELS OF CIRCUIT INTEGRATION POSSIBLE WITH MMIC TECHNOLOGY. THE TFR TECHNOLGY

IS SYNERGISTIC WITH MMIC TECHNOLOGIES, PROVIDING A MECHANISM FOR PURSUING ADVANCED CONCEPT CHIPS AND MODULE DEVELOPMENTS THAT OFFER A POTENTIALLY HIGH PAYOFF TO FUTURE SYSTEMS. THIS PROPOSAL IS FOR A SIX MONTH TECHNICAL PROGRAM DESIGNED TO PROVIDE MAJOR ARCHITECTURAL INNOVATIONS LEADING TO A HIGH LEVEL OF INTEGRATION OF THIN FILM RESONATORS WITH ACTIVE AND PASSIVE CIRCUITS TO BE IMPLEMENTED IN PHASE II.

SRS TECHNOLOGIES
990 EXPLORER BLVD NW
HUNTSVILLE, AL 35806
Program Manager: JAMES M MORRISON
Contract #:
Title: BUILT-IN TEST (BIT) APPROACHES FOR END-TO-END TESTABILITY OF RF CIRCUITS
Topic #: A90-110 Office: ETDL ID #: 39557

THE COMPLEXITY AND HIGH DENSITY OF STATE-OF-THE-ART RF EQUIPMENT IS CREATING AN INCREASED NEED FOR BIT TECHNOLOGY. TEST POINTS ARE MORE DIFFICULT TO ACCESS IN MODERN INTEGRATED RF CIRCUITS AND MAINTAINING A COMPLETE INVENTORY OF RF TEST EQUIPMENT IS BECOMING MORE DIFFICULT AND EXPENSIVE. THE COMPLEXITY OF RF CIRUITRY IS INCREASING THE NECESSARY SKILL LEVEL OF TECHNICANS NEEDED TO DIAGNOSE AND REPAIR HARDWARE FAILURES. NEW AND INNOVATIVE BIT MECHANISMS DESIGNED SPECIFICALLY FOR RF HARDWARE ARE NEEDED TO PROVIDE THE COST EFFECTIVE AND REAL-TIME DETECTION, ISOLATION, AND DIAGNOSIS OF RF CIRCUIT FAILURES. SRS PROPOSES TO DEVELOP END-TO-END BIT TECHNIQUES WHICH WHEN COMBINED PROVIDE NEAR ONE HUNDRED PERCENT FAILURE COVERAGE IN RF CIRCUITS AND EQUIPMENT. SRS'S APPROACH IS BASED ON STIMULATING THE RF CIRCUITS WITH PREFORMATTED TEST PATTERNS WHILE SAMPLING CIRCUIT RESPONSES FROM TEST POINTS AND SENSING INTERFACES TO COMPARE THEM TO STORED SAMPLES OF NOMINAL CIRCUIT RESPONSES. THE EFFORT WILL LEAD TO THE CONCEPTUAL DESIGN OF INTEGRATED END-TO-END BIT METHODS FOR IMPLEMENTATION IN ACTUAL RF HARDWARE IN PHASE II.

CRYSTALLUME
125 CONSTITUTION DR
MENLO PARK, CA 94025
Program Manager: WILSON SMART
Contract #:
Title: DOPED DIAMOND QUANTUM WELLS FOR FIELD EFFECT TRANSISTORS
Topic #: A90-111 Office: ETDL ID #: 39558

IN ORDER TO BET USE NEW GENERATION CVD DIAMOND FILMS FOR ADVANCED ELECTRONIC APPLICATIONS, WE PROPOSE EXTENDING THE PRESENT TECHNOLOGY FOR THE PURPOSE OF GROWING SINGLE CRYSTAL DIAMOND DOPING SUPER- LATTICES. DIAMOND TRANSISTORS OFFER THE POSIBILITY OF HIGH SPEED AND HIGH DENSITY CIRCUITS WHICH ARE OF PARTICULAR IMPORTANCE FOR FUTURE GENERATION SUPERCOMPUTERS. DIAMOND DEVICES NOT ONLY HAVE HIGH THERMAL CONDUCTIVITY BUT CAN FUNCTION AT HIGHER TEMPERATURES SO CONSEQUENTLY CAN SIMPLIFY SUPERCOMPUTER DESIGN WITH RESPECT TO COOLING CONSIDERATIONS. THE PROPOSED RESEARCH PROGRAM IS DIRECTED TOWARDS GROWTH OF DIAMOND DOPING SUPERLATTICES. ONE OF THE MAJOR LIMITATIONS OF PRESENT DIAMOND TECHNOLOGY IS THE LACK OF SHALLOW DOPANT SPECIES, ESPECIALLY NOTABLE WHEN CONSIDERING TRANSISTOR DESIGNS FOR ROOM TEMPERATURE. WE PROPOSE HERE THE FABRICATION OF BORON DOPING SUPERLATTICES IN SUCH A MANNER AS MIMIC SHALLOW DOPANT BEHAVIOUR. THE PROPOSED SUPERLATTICE WILL BE USED TO EFFECTIVELY LOWER DOPANT ACTIVATIN ENERGY SUFFICIENTLY TO ALLOW FOR ROOM TEMPERATURE TRANSISTOR OPERATION.

EMCORE CORP

35 ELIZABETH AVE
SOMERSET, NJ 08873
Program Manager: DR PETER E NORRIS
Contract #:
Title: DEVELOPMENT OF GROWTH APPARATUS FOR THE MICROWAVE PLASMA-ASSISTED DEPOSITION OF DIAMOND-LIKE AND REFRACTORY THIN FILMS
Topic #: A90-112 Office: ETDL ID #: 39559

THE TECHNIQUE OF LOW TEMPERATURE FORMATION OF DIAMOND-LIKE AND REFRACTORY THIN FILMS USING PLASMA-ASSISTED CHEMICAL VAPOR DEPOSITION (PA-CVD) IS CRUCIAL FOR MANY DOD APPLICATIONS. THE DEVELOPMENT OF SUCH A PROCESS FILL PERMIT DEPOSITION OF HIGH QUALITY, SMOOTH SURFACE AND HIGH DENISTY, REFRACTORY FILMS ON A VARIETY OF SUB- STRATES. PA-CVD, USING A MICROWAVE PLASMA SOURCE, IS A VERY ATTRACTIVE THIN FILM DEPOSITION PROCESS FOR DIAMOND-LIKE AND REFRACTORY THIN FILMS. THIS NOVEL PROCESS SUBSTITUTES ELECTRON KINETIC ENERGY FOR CONVENTIONAL THERMAL ENERGY AND ENHANCES COMPOUND FORMATION WITH THE PRESENCE OF ATOMIC OR IONIC SPECIES, THUS OFFERING LOWER TEMPERATURE DEPOSITION, THROUGH THE USE OF NON-THERMAL EQUILIBRIUM GROWTH CONDITIONS. IN ADDITION, THE PA-CVD PROCESS OFFERS THE POTENTIAL ADVANTGES OF LOW COST, LARGE SCALE FABRICATION. OUR APPROACH IS BASED ON PRELIMINARY RESULTS DEMONSTRATED AT EMCORE BY DEPOSITING THIN FILMS OF THE SUPERCONDUCTING CERAMIC OXIDE, YBaCuO, USING MICROWAVE PA-CVD. TEXTURED, HIGH DENSITY, MIRROR SMOOTH SURFACE YBCO FILMS HAVE BEEN FORMED IN SITU AT A REDUCED SUBSTRATE TEMPERATURE OF 570 DEG C. THIS IS OVER 250 DEG C LOWER THAN FOR A THERMAL EQUILIBRIUM CVD PROCES. OUR RESULTS INDICATE THAT THE PROTOTYPE PA-CVD SYSTEM USED IS A SUITABLE STARTING POINT FOR THE DEVELOPMENT OF A SCALABLE PA-CVD SYTEM DESIGN FOR COMMERCIAL R&D AND PRODUCTION MARKETS.

RAMSEARCH CO
4321 HARTWICK RD - STE 418
COLLEGE PARK, MD 20740
Program Manager: DR MILTON PALMER
Contract #:
Title: TEMPERATURE DEPENDENCE OF MICROELECTRONIC DEVICE FAILURES
Topic #: A90-113 Office: ETDL ID #: 39560

THE PURPOSE OF THIS PROJECT IS TO INVESTIGATE MICROCIRCUIT RELIABILITY IN THE TEMPERATURE RANGE OF -55 DEG C TO 125 DEG , IDENTIFY TEMPERATURE DEPENDENCE OF ALL MICROCIRCUIT FAILURE MECHANISMS, IDENTIFY EXISTING MODELS, IDENTIFY GAPS IN THE EXISTING MODELS AND, WHEREVER THE DATA EXISTS, FORMULATE NEW MODELS WHERE THERE ARE NONE. THIS WILL LAY THE FOUNDATION FOR THE PHASE II PROJECT WHICH WILL REFINE AND VALIDATE THE MODELS PROPOSED IN PHASE I. THE KEY FACTOR IS TO DETERMINE THE TEMPERATURE DEPENDENCE OF MICROCIRCUIT FAILURE MECHANISMS. THIS REQUIRES THE INVESTIGATION OF THE VARIOUS PHYSICS OF FAILURE MECHANISMS AND MODES OF FAILURE FOR MICROELECTRONIC DEVICES. THE FINAL REPORT WILL INCLUDE THE TEMPERATURE DEPENDENT EQUATIONS WHICH GOVERN ELECTRONIC EQUIPMENT FAILURES. THESE EQUATIONS MAY BE FUNCTIONS OF ABSOLUTE TEMPERATURE, THE TEMPERATURE CHANGE MAGNITUDE, RATE OF TEMPERATURE CHANGE, TEMPERATURE HISTORY, OR SPATIAL TEMPERATURE GRADIENTS. WE WILL NOT BACK-OUT TEMPERATURE DEPENDENCIES FROM MIL-HDBKS OR INDUSTRY HANDBOOKS IN WHICH THE ACTUAL CAUSE OF FAILURE WAS NOT APPROPRIATELY IDENTIFIED. A DISCUSSION OF TEMPERATURE DEPENDENT FAILURE MECHANISMS FOR MICROELECTRONIC DEVICES FORMS THE BODY OF THIS PROPOSAL.

TECHNO-SCIENCES INC
7833 WALKER DR - STE 620
GREENBELT, MD 20770

Program Manager: K PAUL
Contract #:
Title: AUTOMATED AIRCREW SCHEDULING SYSTEM
Topic #: A90-114 Office: HEL ID #: 39561

TECHNO-SCIENCES (TSI) PROPOSES TO DESIGN AND IMPLEMENT AN AUTOMATED AIRCREW SCHEDULING SYSTEM. THE SCHEDULING SYSTEM WILL INCORPORATE CONSTRAINT DIRECTED REASONING WITH STOCHASTIC OPERATIONS RESEARCH IDEAS, AND WILL LEVERAGE EXISTING SOFTWARE FROM ANOTHER RESOURCE ALLOCATION SYSTEM. CONSTRAIINT DIRECTED REASONING ALLOWS FOR THE EXPLICT REPRESENTATION OF THE RELATIONSHIP BETWEEN SCHEDULING CONSTRAINTS AND UNSATISFIED (MISSION) DEMAND. IT ALSO PROVIDES A MECHANISM FOR RELAXING ACTIVE CONSTRAINTS IN A RATIONAL WAY. THE ACTUAL SCHEDULING ALGORITHMS WE USE ARE DYNAMIC LIST POLICIES AND ARE MOTIVATED BY THE STOCHASTIC NATURE OF THE AVAILABILITY AND DEMAND MODELS. THE SCHEDULING SYSTEM WILL BE IMPLEMENTED ON ARMY COMMON COMPUTER HARDWARE, AND WILL BE MOUSE AND WINDOW DRIVEN.

CHARLES SYSTEMS CORP
820 HEATHERWAY
ANN ARBOR, MI 48104
Program Manager: DR CHARLES J JACOBUS
Contract #:
Title: A COMPACT ROBOTIC COMMAND CENTER SIMULATOR
Topic #: A90-116 Office: HEL ID #: 39562

TO CONSTRUCT AN EMULATION CAPABILITY FOR EXISTING OR PLANNED ROBOTIC COMMAND CENTERS (RCCs) WE PROPOSE TO APPLY TECHNOLOGY DEVELOPED FOR SIMULATION AND CONTROL OF TELEOPERATED SERVICING ROBOTIC SYSTEMS TO THE PROBLEM. AS PART OF A COLLABORATION WITH IN THE CENTER FOR AUTONOMOUS AND MAN-CONTROLLED ROBOTIC AND SENSING SYSTEMS, A NASA SPONSORED CENTER FOR COMMERCIAL DEVELOPMENT OF SPACE AUTOMATION AND ROBOTICS, CAMRSS, OPERATED JOINTLY BY THE UNIVERSITY OF MICHIGAN AND ERIM, THE PROPOING GROUP HAS INTEGRATED SEVERAL COMPREHENSIVE ROBOTIC SIMULATION AND CONTROL SYSTEMS BUILT FROM COMMERCIALLY AVAILABLE COMPONENTS (SILICON GRAPHICS 2G ENGINES COUPLED WITH ROBOTICS SIMULATION SOFTWARE: ROBCAD, DENEB/IGRIP, AND SILMA). THESE SYSTEMS HAVE BEEN INTEGRATED WITH TELEOPERATED USER INTERFACE FRONT-ENDS (CONSTRUCTED VIA RAPID PROTOTYPING GRAPHICS INTERFACE PACKAGES SUPPORTED BY SILICON GRAPHICS), AND WITH ACTUAL ROBOTIC TESTBEDS AT THE BACK-END (WHICH ARE MONITOR BY ON-BOARD SENSORS/CAMERAS AND ARE CONTROLLED THROUGH USER INTERACTION WITH THE SIMULATED ENVIRONMENT). THE PRINCIPAL NON-COMMERCIAL (AND SOMEWHAT TASK SPECIFIC) COMPONENT OF THE EXISTING SYSTEM IS THE SPECIFIC OPERATOR INTERFACE MODEL ROBOTIC SYSTEM SIMULATION DATABASE. IN THE PHASE I EFFORT WE WOULD FOCUS ON EARLY EVALUATION OF STATIC AND DYNAMIC DEMONSTRATIONS TO DETERMINE THE OPTIMAL MODEL AND SYSTEMS CONFIGURATIONS FOR A PHASE II FULL SCALE INTEGRATION PROJECT.

TECHNOLOGY INTERNATIONAL INC
429 W AIRLINE HWY - STE S
LaPLACE, LA 70068
Program Manager: DR ZEINAB A SABRI
Contract #:
Title: COMPACT ROBOTIC COMMAND CENTER SIMULATOR (CORCCS)
Topic #: A90-116 Office: HEL ID #: 39563

TII PROPOSES THE DESIGN, CONSTRUCTION AND TESTING OF A PORTABLE SIMULATOR CAPABLE OF EMULATING THE RCC OPERATOR INTERFACE, AND EVALUATING SEVERAL RCC INTERFACE DESIGNS. THE SIMULATOR IS CAPABLE OF SIMULATING MISSION SCENARIOS AND RECORDING AND DOCUMENTING REAL-

TIME INPUT FROM THE SOLDIER COMMUNITY AND OTHER POTENTIAL END-USERS. THE SIMULATOR MODULES ARE CAPABLE OF BEING EXPANDED AND UPDATED TO REFLECT THE RCC DESIGN MODIFICATIONS AND TO TEST THE OPERATOR RESPONSE TO ALTERNATIVE RCC-SUBSYSTEMS DESIGNS. THE IMULATOR ABILITY TO RECORD AND STORE OPERATORS RESPONSES IN A VALUABLE TOOL IN STRUCTURING THE TRAINING PROGRAMS FOR THE RCC OPERATORS TO SHARPEN CRITICALLY NEEDED SKILLS AND RESPONSES.

ADVANCED PROGRAMMING CONCEPTS INC
102 WESTLAKE DR - STE 109
AUSTIN, TX 78746
Program Manager: SANDEL BLACKWELL
Contract #:
Title: COMBAT VEHICLE TACTICAL DISPLAY SYSTEMS (TDS)
Topic #: A90-117 Office: HEL ID #: 39564

ADVANCED PROGRAMMING CONCEPTS (APC) PROPOSES TO EXPAND A PREVIOUSLY DEVELOPED TACTICAL DISPLAY SYSTEM (TDS) TO ORIENT IT FOR USE BY TANK AND OTHER ARMORED VHEICLE COMMANDERS. THIS TDS WILL (FOR PHASE I) BE UPDATED VIA SMALL VHF PORTABLE RADIOS USING X.25 PROTOCOL. THE TACTICAL DISPLAY WILL CONSIST OF TERRAIN, OWN UNIT POSITION, FRIENDLY AND ENEMY UNIT POSITIONS AND MAP OVERLAYS FOR REFERENCE. FREE TEXT (INTEL ASSESSMENTS, TACREP/TACELINT COMMENTS) AND RADIUS-OF-EFFECT (RADAR DETECTION, FIELD OF FIRE) DATA ALSO CAN BE DISPLAY ON ENEMY UNIT. MESSAGE UPDATES WILL USE FAAD MESSAGE FORMATS EXCEPT FOR SPECIAL FREE TEXT AND FIELD-OF-EFFECT MESSAGES.

RALCON CORP
PO BOX 142 - 8501 S 400RD W
PARADISE, UT 84328
Program Manager: RICHARD D RALLISON
Contract #:
Title: HELMET MOUNTED MULTIFUNCTION DISPLAY (HMMD)
Topic #: A90-117 Office: HEL ID #: 39565

AN IN LINE HELMET OR HEADSET MOUNTED AUDIO-VIDEO INTERACTIVE DISPLAY DESIGN IS PRESENTED THAT HAS ALL OF THE IMAGING AND PROJETION DEVICES ON OR NEAR A FLIP UP FACEPLATE OR VISOR. NO SIDE OR TOP MOUNTED CRT AND PROJECTION LENS IS USED AND AMBIENT LIGHTING IS A REALISTIC POSSIBLE OPTION FOR DISPLAY ILLUMINATION. THE SEE THROUGH QUALITY OF THE DEVICE DEPENDS ON THE POLARIZATION SELECTION PROPERTY OF A CASCADED SANDWICH OF TWO HOLOGRAPHICALLY PRODUCED OFF AXIS ZONE PLATES. THE SANDWICH IMAGES A SMALL LCTV AT NEAR INFINITY AND SIMULTANEOUSLY ACTS AS AN ANALYZER TO VIEW THE ROTATED COMPONENTS OF LIGHT EXISTING FROM THE LCTV. UNDIFFRACTED LIGHT PASSES STRAIGHT THROUGH THE HOE WITH NO IMAGE CONTENT AND CONTAINS THE REAL WORLD VIEW. ILLUMINATION MAY BE AMBIENT AND GRATING DIRECTED OR FROM VARIOUS INTERNAL SOURCES SUCH AS LEDs, LAMPS, GAS DISCHARGES AND DIODE LASERS. COLOR AND STEREO DISPLAYS ARE POSSIBLE ALONG WITH DUPLEX AUDIO COMMUNICATION AND KEYBOARD COMPUTER INTERFACE.

CARLOW ASSOCS INC
8315 LEE HWY - STE 410
FAIRFAX, VA 22031
Program Manager: DR MARK KIRKPATRICK
Contract #:
Title: VISUAL TRANSITION ENHANCEMENT
Topic #: A90-118 Office: HEL ID #: 39566

SINCE THE ADVENT OF ARMORED VEHICLES, SEVERAL PROBLEMS HAVE PLAGUED THEIR DESIGN WHICH DIRECTLY AFFECT THE MANNER IN WHICH THE CREW VIEWS THE BATTLEFIELD AND HOW THEY CAN SUCCESSFULLY COMPLETE THEIR MISSION. OBVIOUSLY THE NEED TO PROTECT THE CREW/EQUIPMENT IS OF PARAMOUNT IMPORTANCE. FROM A DESIGN PERSPECTIVE, THE TRADEOFF HAS ALWAYS BEEN VISION AGAINST ARMOR. SEVERAL ANALYSES CONDUCTED BY CONTRACTOR MATERIAL DEVELOPERS HAVE INDICATED THAT "VISION IS THE WEAKEST LINK IN TANK WARFARE MISSION EFFECTIVENESS". THE OBJECTIVES OF THE PROPOSED INVESTIGATION ARE: 1) TO DEVELOP A PROTOTYPE TEST BED CAPABLE OF EVALUATING THE PERFORMANCE CHARACTERISTICS OF TRANSITION- ING AND RECONCILING BETWEEN TWO DIFFERING VIEWS OF A TARGET; 2) TO CONDUCT A PILOT STUDY, AND 3) AS A RESULT OF THE PILOT STUDY, TO GENERATE AN EXPERIMENTAL PROTOCOL TO PERFORM A LARGER STUDY OF THE EFFECTS OF THE INDEPENDENT VARIABLES ON TRANSITION PERFORMANCE.

PHOTONICS SYSTEMS INC
6975 WALES RD
NORTHWOOD, OH 43619
Program Manager: RAY A STOLLER
Contract #:
Title: SOLDIER COMPATIBLE AIR DEFENSE DISPLAY PRCJECT
Topic #: A90-120 Office: HEL ID #: 39567

PROPOSED HEREIN BY PHOTONICS SYSTEMS, INC. OF NORTHWOOD, OHIO I A PROJECT TO DEVELOP DISPLAY SYSTEMS FOR FORWARD AREA AIR DEFENSE COMMAND AND CONTROL APPLICATIONS. PHASE I OF THIS DEVELOPMENT PROJECT WILL DEFINE THE SYSTEM REQUIREMENTS FOR DISPLAYS, DEVELOP DISPLAY SPECIFICATIONS, PERFORM TRADEOFF STUDIES, RECOMMEND SOFTWARE/INTERFACE(S) AND DEVELOP DISPLAY DESIGN PLANS. HUMAN FACTORS (PHYSICAL AND PSYCHOLOGICAL) ARE OF PRIMARY CONSIDERATION IN ALL ASPECTS OF THE DEVELOPMENT. THE USE OF EXISTING AND EMERGING HARDWARE, SOFTWARE AND COMMUNICATION NETWORKS WILL BE EMPHASIZED IN THE DEVELOPMENT TO MINIMIZE SYSTEM IMPACT AS THE NEW DISPLAYS ARE INSERTED, AND TO MINIMIE DISPLAY IMPACT AS THE SYSTEM CHANGES. THE PHASE I DESIGN PLANS WILL BE DETAILED AND COMPLETE ENOUGH TO PACKAGE, BUILD, INTEGRATE AND DEMONSTRATE THE DISPLAY SYSTEM CONCEPTS DURING A PHASE II PROJECT.

SCIENTIFIC TECHNOLOGY INC
2 RESEARCH PL
ROCKVILLE, MD 20850
Program Manager: CHUNG-DYI HSU
Contract #:
Title: A TEMPERATURE STABLE HIGH PERFORMANCE MULTI-LAYER MICROSTRIP ANTENNA
Topic #: A90-122 Office: HDL ID #: 39568

SCIENTIFIC TECHNOLOGY, INC. PROPOSES TO STUDY SUITABLE FABRICATION TECHNIQUES AND SUBSTRATE MATERIALS FOR THE DEVELOPMENT OF WIDE BAND MULTI-LAYER MICROSTRIP ANTENNAS TO BE USED ON NEXT GENERATION ARTILLERY PROXIMITY FUZES. THE ANTENNAS HAVE BROADER BANDWIDTH AS COMPARED TO THE SINGLE LAYER MICROSTRIP ANTENNAS. TOLERANCE STUDY WILL BE PERFORMED TO PREDICT AMOUNT OF PERFORMANCE CHANGE, E.G., BEAM PATTERN AND RETURN LOSS, DUE TO TOLERANCE IN THE DESIGN PARAMETERS SUCH AS PATCH DIMENSIONS AND DIELECTRIC CONSTANTS. IN PHASE I, SCIENTIFIC TECHNOLOGY INC WILL PREPARE A PRELIMINARY ANTENNA DESIGN AND PROVIDE THE DETAILED TOLERANCE SPECIFICATIONS FOR THE DEVELOPMENT OF FABRICATION AND TESTING OF SUCH ANTENNA IN PHASE II.

SRICO OPTICAL ENGINEERING
664 PETWORTH CT

POWELL, OH 43065
Program Manager: DR S SRIRAM
Contract #:
Title: OPTICAL INTERFEROMETERS FOR SENSING ELECTROMAGNETIC FIELDS
Topic #: A90-123 Office: HDL ID #: 39569

THE OBJECT OF THE PROPOSED EFFORT IS TO ESTABLISH THE FEASIBILITY OF PRODUCING AN ELECTRODE-LESS MACH-ZEHNDER INTERFEROMETER FOR MEASURING ELECTROMAGNETIC FIELDS. AN ELECTRODE-LESS DEVICE IS EXPECTED TO BE MORE ACCURATE THAN A CONVENTIONAL DEVICE DUE TO THE ABSENCE OF ANY METAL ELECTRODES THAT TEND TO DISTURB THE FIELDS. THE KEY TO THE PROPOSED EFFORT IS THE TECHNIQUE OF SELECTIVELY REVERSE POLING A CHANNEL WAVEGUIDE SECTION IN THE CRYSTAL MATERIAL, LITHIUM NIOBATE, BY APPROPRIATE CHOICE OF CRYSTAL ORIENTATION AND TITANIUM DIFFUSION CONDITIONS. A MACH-ZEHNDER WAVEGUIDE INTERFEROMETER IS THEN CREATED USING A LOW TEMPERATURE PROTON EXCHANGE PROCESS IN WHICH ONE LEG OF THE INTERFEROMETER IS SUPERIMPOSED ON TOP OF THE REVERSE POLED CHANNEL CREATED IN THE PREVIOUS TEP. THE EFFECT OF AN EXTERNAL ELECTRI FIELD IN AN ELECTRODE-LESS DEVICE IS EQUIVALENT TO APPLYING VOLTAGES OF OPPOSITE POLARITIE TO THE ELECTRODES IN A CONVENTIONAL DEVICE. A NOVEL COMPLEMENTARY PHOTODETECTION SCHEME IS PROPOSED THAT REPLACES THE OUTPUT Y-BRANCH OF THE INTERFEROMETER WITH A DIRECTIONAL COUPLER. THIS GREATLY REDUCES THE EFFECTS OF LASER INTENSITY NOISE AND THUS LEADS TO TENS OF dB IMPROVEMENT IN DYNAMIC RANGE (>40 dB FOR A 1 GHz BANDWIDTH). A COMPACT LOW VOLTAGE CALIBRATION SYSTEM IS DECRIBED THAT EXPLOITS THE SMALL SIZE OF THE INTEGRATED OPTICAL DEVICE.

ROBOTIC VISION SYSTEMS INC
425 RABRO DR E
HAUPPAUGE, NY 11788
Program Manager: SULLIVAN S CHEN
Contract #:
Title: CORRELATION OF SOLDER JOINT MEASUREMENTS TO PROCESS VARIABLES FOR STATISTICAL PROCESS CONTROL
Topic #: A90-124 Office: HDL ID #: 39570

THIS PROGRAM WILL INVESTIGATE THE RELATIONSHIP BETWEEN PRINTED CIRCUIT BOARD ASEMBLY EQUIPMENT PROCESS VARIABLES AND THE GEOMETRIC CHARACTERISTICS OF SOLDER JOINTS TO DEVELOP A BASELINE FOR STATISTICAL PROCESS CONTROL. IT IS GENERALLY ACCEPTED THAT A NUMBER OF UPSTREAM PROCESS VARIABLES IMPACT THE GEOMETRY AND, THEREFORE, THE PERFORMANCE OF CIRCUIT OARD SOLDER JOINTS. A CLEAR DEFINITION OF THIS RELATIONSHIP, HOWEVER, HAS NOT YET BEEN DEVELOPED DUE TO THE UNAVAILABILITY OF ACCURATE DIMENSIONAL MEASUREMENTS OF SOLDER JOINT GEOMETRY. RECENT BREAKTHROUGHS BY RVSI IN THREE-DIMENSIONAL MACHINE VISION TECHNOLOGY HAVE ALLOWED, FOR THE FIRST TIME, HIGH RESOLUTION MEASUREMENTS OF SOLDER GEOMETRY, CREATING THE OPPORTUNITY TO DEVELOP A DEFINITIVE CORRELATION BETWEEN UPSTREAM PROCESS VARIABLES AND DOWNSTREAM SOLDER JOINT CHARACTERISTICS. WITH THIS NEW UNDERSTANDING, A REAL-TIME SOLDER PROCESS CONTROL SYSTEM COULD BE IMPLEMENTED, ALLOWING A REDUCTION IN PRINTED CIRCUIT BOARD DEFECTS. THE PROPOSED PROGRAM WOULD BEGIN THE EFFORT NECESSARY TO CREATE SUCH A CIRCUIT BOARD PROCESS CONTROL SYSTEM BY PROVIDING CIRCUIT BOARD PRODUCTION EQUIPMENT VARIABLES AND THE QUALITY OF THE FINISHED PRODUCT.

OPTECH LAB
22048 SHERMAN WY - #107
CANOGA PARK, CA 91303
Program Manager: DR SHI-KAY YAO
Contract #:

Title: GUIDED-WAVE TeO2
Topic #: A90-125 Office: HDL ID #: 39571

FEASIBILITY STUDY AND DESIGN EFFORT FOR NEW EXTREMELY EFFICIENT WIDEBAND LARGE TIME-BANDWIDTH PRODUCT AND LOW SPURIOUS RESPONSE ACOUSTO-OPTIC BRAGG CELLS ARE PROPOSED. AN ADVANCED BULK SLOW SHEAR WAVE BRAGG CELL WITH 70 MICRO-SECOND DELAY TIME AND 45 MHz BANDWIDTH WILL BE DESIGNED AND FABRICATED FOR IN-HOUSE EVALUATION. THIS DEVICE WILL BE DELIVERED TO THE ARMY FOR FURTHER EVALUATION AT THE END OF THIS PROPOSED PROGRAM. EXPLORATION OF SURFACE ACOUSTIC WAVES ON TeO2 WILL BE CONDUCTED BOTH ANALYTICALLY AND EXPERIMENTALLY. THE INVESTIGATION INCLUDE LAUNCHING OF SAW ON TeO2, PHYSICAL PROPERTIES OF SAW OF TeO2, INTERACTION WITH LASER BEAM, AND ADVANCED TECHNIQUES. POSSIBILITY OF OPTICAL GUIDEDWAVE ACOUSTO-OPTIC DEVICES WILL ALSO BE STUDIED. SAMPLE OF THE BEST SAW LAUNCHING UNIT ON TeO2 WILL BE DELIVERED FOR FURTHER EVALUATION. THE ANALYTICAL AND EXPERIMENTAL RESULTS WILL BE PRESENTED IN THE FINAL TECHNICAL REPORT. THESE RESULTS WILL BE EMPLOYED FOR RECOMMENDATION OF PHASE II EFFORT.

ELECTRONICS DEVELOPMENT CORP
6905-G OAKLAND MILLS RD
COLUMBIA, MD 21045
Program Manager: ROBERT N JOHNSON
Contract #:
Title: ACCELERATION SENSING MODULE FOR MUNITION SAFETY SYSTEMS
Topic #: A90-126 Office: HDL ID #: 39572

THE PROPOSED PROGRAM INCLUDES THE ANALYSES, INVESTIGATIONS, AND EVALUATIONS NECESSARY TO RECOMMEND A DESIGN OF A MINIATURE, LOW-COST ACCELERATION SENSING AND INTEGRATING MODULE FOR USE IN MISSILE SAFETY AND ARMING SYSTEMS. THE DESIGN GOALS INCLUDE A SIZE NOT TO EXCEED 0.03 IN(2) AND A COST OF $15 EACH IN QUANTITIES OF 100. A BASIC SYSTEM ARCHITECTURE OF AN ACCELERATION TRANSDUCER AND A SIGNAL PROCESSOR IS PROPOSED. SEVERAL TRANSDUCER TECHNOLOGIES ARE IDENTIFIED FOR CONSIDERATION. FACTORY PROGRAMMABLE GAIN, CALIBRATION, AND THRESHOLD SETTINGS ALLOW A SMALL FAMILY OF SENSORS TO COVER A WIDE RANGE OF MUNITION LAUNCH ENVIRONMENTS. PROTOTYPE TRANSDUCERS AND BREADBOARD ELECTRONICS WILL BE BUILT AND EVALUATED DURING PHASE I. PHASE II WILL INCLUDE FULLY INTEGRATED ELECTRONICS AND FABRICATION AND TESTING OF A DESIGN QUALIFICATION LOT.

FERRITE COMPONENTS INC
PO BOX 506 - 10 KIDDER RD
CHELMSFORD, MA 01824
Program Manager: WILLIAM J ALTON
Contract #:
Title: ELECTROMAGNETIC PROTECTORS FOR MICROWAVE CIRCUITRY
Topic #: A90-127 Office: HDL ID #: 39573

A PROGRAM IS PROPOSED TO INVETIGATE FERRITE MATERIALS AND LIMITING/SURGE PROTECTION TECHNIQUES. HIGH POWER FERRITE DEIGN APPROACHES WILL BE INCORPORATED TO ENHANCE THE DYNAMIC RANGE FIELD CONCENTRATION WILL BE INVESTIGATED TO REDUCE THE THRESHOLD. AN EXPERIMENTAL DEMONSTRATION IS INCLUDED.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545

Program Manager: ROCKY R ARNOLD
Contract #:
Title: LIGHTWEIGHT COMPOSITE MATERIALS FOR EMI/EMP SHIELDING
Topic #: A90-128 Office: HDL ID #: 39574

THE OBJECTIVE OF THIS PHASE I RESEARCH IS TO IDENTIFY A LOW COST, LIGHTWEIGHT, COMPOSITE MATERIAL WHICH CAN BE USED TO HARDEN A SHELTER AGAINST EMI/EMP THREATS. THE WEIGHT REDUCTION GOAL OF 80% OF EXISTING 30 MIL ALUMINUM SHEET IS AMBITIOUS, BUT WITH THE RECENT DEVELOPMENT OF CONDUCTIVE POLYMERS AND FIBER REINFORCED COMPOSITE MATERIALS, SUCH A GOAL IS ATTAINABLE. THE RESEARCH PROPOSED HEREIN IDENTIFIES A NUMBER OF NEW MATERIAL TECHNOLOGIES FOR INITIAL EVALUATION AND SCREENING. SEVERAL MATERIALS WILL BE SELECTED FOR FURTHER EXPERIMENTAL EVALUATION FOR SHIELDING EFFECTIVENESS IN ACCORDANCE WITH MIL-STD-907B AND MIL-STD-285. BASED UPON THE MATERIALS' SHIELDING EFFECTIVENESS (-60 dB IS THE REQUIREMENT), MECHANICAL PROPERTIES, AND OTHER FACTORS SUCH AS COST, EASE-OF- FABRICATION, AND RESISTANCE TO OTHER ENVIRONMENTAL FACTORS (HUMIDITY, TEMPERATURE0, ONE OF THE CANDIDATE MATERIALS WILL BE RECOMMENDED FOR FURTHER STUDY AND DEVELOPMENT DURING ANY PHASE II WORK.

MEI RESEARCH
40975 CHILTERN DR
FREMONT, CA 94539
Program Manager: JUZER S MOGRI
Contract #:
Title: AN 8-BIT 2 GHZ INTEGRATING ANALOG-TO-DIGITAL CONVERTER FOR COHERENT-ON-RECEIVE UWB (ULTRAWIDE BANDWIDTH) RADAR
Topic #: A90-129 Office: HDL ID #: 39575

RADAR DETECTION OF WEAK TARGETS IN THE PRESENCE OF A HIGH LEVEL OF CLUTTER NECESSITATES AN ULTRA WIDE BANDWIDTH ANALOG-TO-DIGITAL CONVERTER (ADC) WITH SUFFICIENT RESOLUTION. THIS PROPOSAL PRESENTS A TECHNICAL APPROACH AND SYSTEM ARCHITECTURE FOR AN 8-BIT, 2 GHZ FULL SCALE BANDWIDTH INTEGRATING ADC TO SATISFY THIS NEED. ADDITIONALLY, THE ADC WILL BE DRIVEN BY A CLOCK SIGNAL WHICH CAN BE SYNCHRONIZED TO A TRIGGER PULSE WITH A RESOLUTION OF +/- 0.5 PICO- SECOND. SUCH AN ADC WOULD FACILITATE THE DEVELOPMENT OF A COHERENT- ON-RECEIVER UWB (ULTRA WIDE BANDWIDTH) RADAR RECEIVERS. WHAT IS PROPOSED IS A "FLASH" ADC ARCHITECTURE, WITH FAST ACT (ACOUSTIC CHARGE TRANSPORT) SAMPLERS ON THE FRONT-END, AND SLOWER, COMMERCIALLY AVAILABLE 8-BIT ADCs ON THE BACK-END. TWO EMBODIEMENTS ARE DESCRIBED. ONE NECESSITATES USING THE ACT DEVICE AS A SERIAL OF PARALLEL CONVERTER IN ADDITION TO A SAMPLER AND REALIZES 8 BITS OF ADC SYSTEM RESOLUTION. THE OTHER DOES NOT REQUIRE ANY SERIAL TO PARALLEL SHIFTING BUT ACHIEVES ONLY 6 BITS OF RESOLUTION.

MEDICAL MICROWAVE RESEARCH CORP
808 PERSHING DR - STE 104
SILVER SPRING, MD 20910
Program Manager: LAWRENCE E LARSEN
Contract #:
Title: NONDESTRUCTIVE EVALUATION OF ADHESIVE BONDS IN COMPOSITE MATERIALS
Topic #: A90-130 Office: MTL ID #: 39577

ADHESIVELY JOINED STRUCTURES ARE A COMMON FEATURE OF MANY MILITARY, COMMERCIAL, AND MEDICAL APPLICATIONS. THESE MAY EMPLOY COMPOSITE TO COMPOSITE (E.G. LAMINATED PANELS OR FIBER/RESIN SKINS ON NONMETALLIC HONEYCOMB) AND/OR COMPOSITE TO METALLIC (E.G. FIBER/RESIN SKINS ON ALUMINUM HONEYCOMB) ADHERENDS. STRUCTURES ARE ALSO MADE OF SEGMENTS WITH LOCALLY TAILORED PROPERTIE WHEREIN THE FINAL REULT DEPENDS UPON BONDS BETWEEN THE

SEGMENTS. YET NO FULLY SATISFACTORY METHOD OF INSPECTION FOR BONDS EXISTS (STONE, 1986). THIS SHORTFALL HAS A GROWING INFLUENCE, ESPECIALLY IN THE TESTING OF ADHESIVE REPAIRS TO COMPOSITE STRUCTURES AS THE USE OF COMPOSITE MATERIALS PROLIFERATE. PROPERLY PERFORMED, ADHESIVE REPAIRS ARE BETTER THAN MECHANICAL REPAIRS IN SUCH STRUCTURES (KELLY, 1984). THE PRESENT PROPOSAL ADDRESSES THE PROBLEM OF BOND TESTING WITH A NEW METHOD THAT IS ESPECIALLY SUITABLE FOR HIGH SPEED SCREENING OF BONDED STRUCTURES. PHASE I IS A PROOF OF PRINCIPLE FOR DETECTION OF BOND DEFECTS IN THE MATERIALS CITED ABOVE WHEREAS PHASE II INCLUDES DEFECT LOCALIZATION PLUS LARGE SCALE TESTING.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
Program Manager: DR CHARLES C BLATCHLEY
Contract #:
Title: NDE OF INTERFACIAL BONDS BY MICRO-SCANNING GAMMA BACKSCATTERING
Topic #: A90-130 Office: MTL ID #: 39576

ADHESIVELY BONDED STRUCTURAL MATERIALS REQUIRE NONDESTRUCTIVE METHODS OF INSPECTION AND EVALUATION (NDI/E) TO DETECT CRACKS, VOIDS, AND INCLUSIONS WHICH DIRECTLY AFFECT BOND STRENGTH. LACK OF RELIABLE NDI/E, PARTICULARLY DURING MANUFACTURE, WILL FORCE RELIANCE ON LARGE DESIGN MARGINS OF SAFETY AND EXPENSIVE DESTRUCTIVE TESTING. PHASE I WILL ADDRESS THESE NEEDS WITH GAMMA-RAY BACKSCATTER RADIOMETRY USING A COLLIMATED DETECTOR TO ACHIEVE NEAR MICROSCOPIC RESOLUTION. THIS IS SIMILAR TO BACKSCATTER TOMOGRAPHY (BOTH REQUIRE ACCESS TO A SINGLE SURFACE), BUT INSTEAD OF CREATING AN INTEGRATED IMAGE, INTERSECTING DETECTOR AND SOURCE VIEWS MEASURE DENSITY IN ONE PIXEL AT A TIME. FINER RESOLUTION IS ACHIEVED USING STACKS OF CONVERGING PLANAR VANES OR OTHER CONFIGURATIONS TO FOCUS THE VIEW TO A SMALL REGION. INSPECTION WOULD SCAN THIS REGION AT VARIOUS DEPTHS BELOW THE SURFACE OR COULD MAP A LARGER VOLUME AND THUS ENABLE DETAILED IMAGING. RECENT APPLICATIONS TO COMPOSITES SUGGET IT SHOULD BE POSIBLE TO ADJUST THE SENSITIVE VOLUME TO LESS THAN 1 MM(3), ENABLING DETECTION OF DEFECT SIZES ON THE ORDER OF A FEW MICROMETERS. PHASE I WILL DETERMINE FEASIBILITY OF SUCH MICROSCOPIC SCANNING IN REPRESENTATIVE COMPOSITE MATERIALS. PENDING THE OUTCOME OF THESE TESTS, A PROTOTYPE INSPECTION SYSTEM WILL BE DEVELOPED IN PHASE II AND CALIBRATED WITH APPROPRIATE DESTRUCTIVE TESTS.

PDA ENGINEERING
3754 HAWKINS NE
ALBUQUERQUE, NM 87109
Program Manager: RONALD E ALLRED
Contract #:
Title: REACTIVE COUPLING AGENTS FOR IMPROVED ADHESIVE BONDS
Topic #: A90-131 Office: MTL ID #: 39578

A FAMILY OF REACTIVE COUPLING AGENTS BASED UPON AN EXOTHERMIC DECOMPOSITION IS BEING DEVELOPED. THE REACTION MAY BE INITIATED THERMALLY OR WITH ACTINIC LIGHT. INITIATION MAY BE VARIED OVER A WIDE RANGE OF TEMPERATURES OR WAVELENGTHS, WHICH ALLOWS THE BONDING REACTION TO BE TAILORED TO THE ADHESIVE CURE PROCESS. EARLY STUDIES HAVE SHOWN THE FEASIBILITY OF USING THIS CHEMISTRY TO BOND TO METALS, CERAMICS AND POLYMERS. THE PROPOSED PHASE I PROGRAM WILL EXTEND THE DATA BASE TO SUBSTRATE OF INTEREST TO THE U.S. ARMY AND EXAMINE THERMAL AGING EFFECTS ON COUPLING AGENT/PRIMER SOLUTIONS AND BONDED JOINTS. DURABILITY OF BONDED JOINTS EXPOSED TO HOT-WET CONDITIONS WILL ALSO BE EXAMINED. THESE DATA WILL DICTATE PACKAGING CONCEPTS AND DEMONSTRATE THE POTENTIAL FOR OBTAINING MORE RELIABLE AND DURABLE ADHESIVE JOINTS USING THE REACTIVE COUPLIG AGENT WITH COMMERCIALLY AVAILABLE ADHESIVES.

FIMOD CORP
PO BOX 11192
BLACKSBURG, VA 24062
Program Manager: BERND D ZIMMERMANN
Contract #:
Title: FIBER OPTIC SENSORS FOR IN-SITU PROCESS MEASUREMENTS WITHIN ORGANIC MATRIX COMPOSITE MATERIALS
Topic #: A90-132 Office: MTL ID #: 39579

WE PROPOSE AN IN-SITU OPTICAL FIBER ORGANIC MATRIX CURE/TEMPERATURE MONITOR WHICH ALLOWS ACCURATE DETERMINATION OF LOCALIZED STATE OF CURE DURING TYPICAL COMPOSITE FABRICATION PROCESSES. THE SYSTEM CONSISTS OF A RESIN FIBER WAVEGUIDE ENSOR WHICH MEASURES CHANGES OF REFRACTIVE INDEX AS THE RESIN CURES, AND A NON-SILICA CORE FIBER DISTRIBUTED TEMPERATURE SENSOR WHICH COMPENSATES FOR TEMPERATURE INDUCED REFRACTIVE INDEX CHANGES. THE PROPOSED SENSOR COMBINATION ALLOWS LOCALIZED, REAL TIME MEASUREMENTS, AND PROVIDES POSSIBILITIES FOR POST PROCESS APPLICATIONS OF ITS EMBEDDED FIBERS. IT IS EXPECTED THAT THE SUGGESTED APPROACH WILL EVENTUALLY PROVIDE CAPABILITIES FOR PRECISE PROCESS CONTROL THROUGH THE IMPLEMENTATION OF SOPHISTICATED FEEDBACK ALGORITHMS.

TECHNOLOGY ASSOCS
17911 SAMPSON LN
HUNTINGTON BEACH, CA 92647
Program Manager: GARY ALLEN
Contract #:
Title: METAL INJECTION MOLDING OF TUNGSTEN HEAVY ALLOYS
Topic #: A90-133 Office: MTL ID #: 39580

TUNGSTEN HEAVY ALLOYS ARE METAL MATRIX COMPOSITES (MMC'S) HAVING UNIQUE COMBINATIONS OF STRENGTH, DUCTILITY AND DENSITY. THEIR FINAL MICROSTRUCTURE CONSISTS OF A CONTIGUOUS NETWORK OF TUNGSTEN GRAINS EMBEDDED IN A MATRIX OF A TUNGSTEN-NICKEL-IRON ALLOY. THE MAJORITY OF THEIR MILITARY APPLICATIONS REQUIRE A COMPLEX SHAPED FINAL FORM THAT IS GENERALLY OBTAINED BY MACHINING WHICH IS COSTLY AND RESULTS IN THE LOSS OF EXPENSIVE MATERIAL. METAL INJECTION MOLDING (MIM) IS A PROCESS IDEALLY SUITED FOR PRODUCING COMPLEX SHAPES. IT WOULD BE OF GREAT ADVANTAGE IF MIM CAN BE USED TO SUCCESSFULLY RETAIN THE UNIQUE PROPERTY COMBINATION OF TUNGSTEN HEAVY ALLOYS, WHICH ARE EXTREMELY SENSITIVE TO PROCESSING CONDITIONS, IMPURITIES, AND POST SINTERING TREATMENTS. THE TECHNICAL FEASIBILITY OF MIM AS AN ECONOMIC MANUFACTURING METHOD FOR TUNGSTEN HEAVY ALLOYS INTO NET COMPLEX PARTS WILL BE ANSWERED DURING THIS RESEARCH. PHASE I WILL ADDRESS THE KEY ISSUES OF: POWDER-BINDER MIXING, OPTIMUM SOLID LOADING OF THE BINDER, ALLOY ADDITIVES, INJECTION MOLDING, DEBINDING, PROPER SINTERING AND HEAT TREATMENT SCHEDULE, EVALUATION AND COMPARISON OF THE TENSILE PROPERTIES WITH CLASSIC PRESS/SINTERED ALLOYS, AND MICROSTRUCTURAL ANALYSIS.

INNOVATIVE CERAMICS INC
PO BOX 251
EAST AMHERST, NY 14051
Program Manager: DR JAN A PUSZYNSKI
Contract #:
Title: HIGHLY ENERGY EFFICIENT PREPARATION OF THICK COATINGS BY EXOTHERMAL REACTION
Topic #: A90-134 Office: MTL ID #: 39581

A RESEARCH PROGRAM IS PROPOSED TO DEVELOP A HIGHLY ENERGY EFFICIENT PROCESS OF THICK

COATING FORMATION BY COMBUSTION REACTION OF THE TYPE SOLID-SOLID IN THE PRESENCE AND ABSENCE OF CNETRIFUGAL FORCES. THE EFFECT OF SUBSTRATE PREHATING, AMOUNT OF FLUXES AND BINDERS WILL BE OPTIMIZED FOR VARIOUS REACTING SYSTEMS. THE MAIN ATTENTION WILL BE PAID TO THE ADHESION OF A COATING TO DIFFERENT METALLIC AND CERAMIC SUBSTRATES.

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301
Program Manager: MARK A HANDSCHY
Contract #:
Title: INFRARED MODULATORS USING FERROELECTRIC LIQUID CRYSTALS
Topic #: A90-136 Office: VAL ID #: 39582

WHILE MILITARY APPLICATIONS OF MID- AND FAR-INFRARED SENSING ARE INCREASING, THERE ARE VERY FEW TECHNOLOGIES AVAILABLE FOR LIGHT MODULATION IN THOSE SPECTRAL BANDS. WE PROPOSE TO DEVELOP NON-MECHANICAL SHUTTERS USING THE ELECTRO-OPTIC EFFECT IN FERROELECTRIC LIQUID CRYSTALS. THE SHUTTERS WE PROPOSE WILL BE SMALL AND RUGGED, AND HAVE HIGH THROUGHHPUT (70-90%), HIGH ON:OFF CONTRAST (40:1 OR GREATER), WIDE-SPECTRAL-BAND OPERATION (E.G. 3-5 um), HIGH SWITCHING SPEEDS (100 us), AND LOW POWER CONSUMPTION (10 uJ/cm2/SWITCHING). PHASE I DEMONSTRATION MODULATORS WILL HAVE 12 mm APERTURES, WHICH CAN BE INCREASED TO SEVERAL INCHES DURING PHASE II DEVELOPMENT. INITIAL WORK IN PHASE I WILL CONCENTRATE ON THE 3-5 um SPECTRAL BAND, WITH EXTENSION TO THE 8-14 um BAND POSSIBLE DURING PHASE II.

VULN/EVAL ASSOCS
5 ROSEDALE TER
HOLMDEL, NJ 07733
Program Manager: JAMES E BARTOW
Contract #:
Title: EW VULNERABILITY EVALUATION METHODOLOGY FOR COMMUNICATION SYSTEMS
Topic #: A90-137 Office: VAL ID #: 39583

THE GOAL OF THIS PROGRAM IS TO DEVISE A METHODOLOGY FOR THE EVALUATION OF THE EW VULNERABILITY OF COMPLEX COMMUNICATION SYSTEMS IMBEDDED IN A NETWORK. IN ORDER TO DEVELOP THIS METHODOLOGY THE PARAMETERS OF THE COMMUNICATION SYSTEM MUST BE IDENTIFIED AND DEFINED, THE INTERRELATIONSHIPS AMONG THESE PARAMETERS MUST BE IDENTIFIED, THE INTERFERENCE WAVEFORMS MUST BE ASSESSED, THE NETWORK STRUCTURE AND COMPOSITION MUST BE DETERMINED, MEASURES OF PERFORMANCE MUST BE ESTABLISHED AND DEFINED, AND ALGORITHMS RELATING THE MEASURES OF PERFORMANCE TO THE PARAMETERS, INTERRELATIONSHIPS, INTERFERENCE WAVEFORMS, AND NETWORK STRUCTURE MUST BE DERIVED. INCLUDED IN THE ASESSMENT TASK IS THE INVENTION OF SIMPLE MEANINGFUL METHODS OF PRESENTATION OF THE RESULTS. THE BENEFITS OF THIS PROGRAM INCLUDE THE ESTABLISHMENT OF A STANDARDIZED METHODOLOGY FOR EVALUATING THE PERFORMANCE OF NETTED COMMUNICATION SYSTEMS IN A STRESSED ENVIRONMENT. COMMERCIAL APPLICATIONS INCLUDE THE EVALUATION OF RADIO TELEPHONE SYSTEMS IN LOCAL AREA NETWORKS WHICH ARE STRESSED BY SELF INTERFERENCE, BACKGROUND NOISE, AND FADING SIGNALS. THE USE OF A WELL DEFINED CONSISTENT METHODOLOGY IN ASSESSING PERFORMANCE OF COMPETING SYSTEMS AND EVALUATING CHANGES AND IMPROVEMENTS IN SYSTEMS WILL BENEFIT BOTH INDUSTRY AND THE GOVERNMENT.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: ROBERT J GRASSO

Contract #:
Title: SPECTRALLY ENHANCED PULSED PLASMA
Topic #: A90-138 Office: VAL ID #: 39584

THE PROGRAM PROPOSED HERE IS FOR THE CHARACTERIZATION OF A SPECTRAL TAILORED SURFACE DISCHARGE PULSED PLASMA. ELECTRO-OPTICAL COUNTER- MEASURES (EOCM) ARE REQUIRED TO OPERATE WITHIN SOME SPECTRAL BAND- WIDTH TO DEFEAT POTENTIAL THREATS. MOT EOCM DEVICES RELY UPON BROADBAND BLACKBODY EMITTERS THAT LACK SPECTRAL SELECTIVITY. WHEN A PLASMA DISCHARGE OCURRS ON A SURFACE, SOME OF THE IONS FROM THE SURFACE SUBSTRATE ARE PULLED OFF AND THEIR ELEMENTAL CONSTITUANTS BECOME ENERGETICALLY EXCITED AND EMIT RADIATION. THUS, THE RADIANCE MAY BE ENHANCED BY SELECTING A SUBSTRATE WITH KNOWN EMISSION PROPERTIES IN THE SPECTRAL REGION OF INTEREST. MEASUREMENTS WILL BE PERFORMED TO DETERMINE BOTH THE BROADBAND AND DISCRETE SPECTRAL RADIANCE AS A FUNCTION OF SUBSTRATE ELEMENTAL COMPOSITION. THE PROPOSED PROGRAM IS IMPORTANT BECAUSE IT WILL LEAD TO EFFICIENT SPECTRALLY ENHANCED, EOCM DEVICES. THESE DEVICES WILL USE A SURFACE DISCHARGE PLASMA AS THE SPECTALLY TAILORED RADIATIVE SOURCE. THE PHASE I PROGRAM WILL PROVIDE A FUNDAMENTAL CHARACTERIZATION OF THE SURFACE DISCHARGE SPECTRAL RADIANT ENHANCEMENT IN THE ULTRAVIOLET, VISIBLE AND INFRARED SPECTRAL REGIONS. THE PHASE II PROGRAM WILL OPTIMIZE THE SPECTRAL EMISSIVE CHARACTERIZED THE DISCHARGE ON THE OUTSIDE OF A CYLINDER FOR 360 DEG DIRECTIONAL COVERAGE.

OPTRON SYSTEMS INC
3 PRESTON CT
BEDFORD, MA 01730
Program Manager: THOMAS HORSKY
Contract #:
Title: MEMBRANE LIGHT VALVE-BASED MULTI-SPECTRAL IR TARGET SIMULATOR
Topic #: A90-139 Office: VAL ID #: 39585

WE PROPOSE TO DEVELOP A NEW INFRARED TARGET SIMULATION SYSTEM BASED ON AN ELECTRON-BEAM-ADDRESED MEMBRANE LIGHT VALVE. THIS NEW DEVICE DIRECTLY INTERFACES WITH A COMPUTER AND IS EXPECTED TO OFFER SIMULATED SCENES WITH LARGE DYNAMIC RANGE RATIO, HIGH CONTRAST, HIGH RESOLUTION, LARGE NUMBERS OF STATIC AND FAST-MOVING TARGETS, AND REAL-TIME OPERATION. THIS DEVICE OVERCOME THE LOW RESOLUTION, SLOW FRAME RATES AND DYNAMIC-RANGE LIMITATIONS OF THERMAL DEVICES SUCH AS RESISTOR ARRAYS AND THE BLY CELL. THE PHASE I PROGRAM INVOLVES DEVICE DESIGN OPTIMIATION AND MODELLING COMPONENT DEVELOPMENT AND TESTING, AND THE DEMONSTRATION OF A PROTOTYPE MODULATOR. THE PROTOTYPE MODULATOR IS EXPECTED TO EXHIBIT >10(4) RESOLUTION ELEMENTS AND A DYNAMIC RANGE RATIO OF ABOOUT 25 IN A SINGLE COLOR. THE DEVICE DEIGN CHOSEN IS SUCH THAT THE MODULATOR CAN SIMULATE TARGETS OVER A LARGE TEMPERATURE RANGE (UV TO MID-IR) WITH MINIMAL MODIFICATION. THUS IN THE PHASE II PROGRAM, WITH FURTHER DEVELOPMENT, WE EXPECT TO UPGRADE THE PERFORMANCE OF THE PROTOTYPE DEVICE AND COMBINE TWO OF THESE MODULATORS TO MEET, AT THE VERY LEAST, ALL THE REQUIREMENTS OF THE OPERATIONAL STAGE (30-60 Hz FRAME RATE, 256x256 PIXELS, SINGLE FRAME DYNAMIC RANGE RATIO OF 30 WITH AN EFFECTIVE MULTI-FRAME DYNAMIC RANGE OF 10(30, AND TWO COLORS).

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: DR IRVING OSOFSKY
Contract #:
Title: FLETCHETTE EXPULSION AUGMENTATION MECHANISM
Topic #: A90-140 Office: AVSCOM ID #: 39586

SPARTA PROPOSES TO UTILIZE A COMBINATION OF TWO COMPLEMENTARY TECHNIQUES FOR INCREASING PATTERN SIZE WITH LITTLE OR NO REDUCTION IN THE NUMBER OF FLECHETTES PER WARHEAD. THE FIRST TECHNIQUE WOULD UTILIZE BUILT IN RANDOM PITCH/YAW/ROLL DEFLECTIONS OF THE FLECHETTE VANES TO CAUSE LATERAL GROWTH OF THE PATTERN IN FLIGHT DUE TO PRE-PROGRAMMED DEVIATION OF THE INIDIVIDUAL FLECHETTE FLIGHT PATHS. THE SECOND TECHNIQUE WOULD UTILIZE A SMALL CENTRALLY IMBEDDED, LATERALLY EXPANDING, PRESSURIED "BALLOON" OR RADIAL BELLOWS" TO IMPART AN INITIAL RADIAL VELOCITY AND DISPLACEMENT TO THE DISPENSED CLUSTER OF FLECHETTES. BOTH TECHNIQUES WOULD COMBINED TO OPTIMIZE THE FLECHETTE PATTERN INCLUDING ELIMINATING ANY HOLE IN THE PATTERN DUE TO INITIAL RADIAL VELOCITY.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821
Program Manager: R C MIAKE-LYE
Contract #:
Title: A COLD FLOW TEST FACILITY FOR IR SUPPRESSORS
Topic #: A90-141 Office: AVSCOM ID #: 39587

THE PRESENT NEED TO TEST IR SUPPERSSORS ON APPLICATION ENGINES INCURS SIGNIFICIANT COSTS DUE TO THE REQUIREMENTS OF A FULL-SCALE ENGINE INCLUDING: ITS FUEL UE, SAFE EXHAUST DISPOSAL, AND THE NECESSITY OF UTILIZING FULL-SCALE, HEAT-RATED SUPPRESSOR PROTOTYPES. THESE COSTS CAN BE REDUCED USING A CORRECTLY SCALED AMBIENT TEMPERATURE TEST FACILITY. RELIABLE ESTIMATES OF GAS TURBINE ENGINE EXHAUST SYSTEM PERFORMANCE CAN BE OBTAINED FROM COLD FLOW SIMULATIONS BY USING A STAGNATION TEMPERATURE SIMILARITY PRINCIPLE. THE USE OF SUCH SIMILARITY ALONG WITH POSSIBLE SCALING OF THE PHYSICAL SIZE OF THE FLOW ALLOWS A LABORATORY SIMULATION FACILITY TO BE REALIZED - A PROPOSED COLD FLOW TEST STAND (CFTS). THE DESIGN OF THIS FACILITY WILL BE OPTIMIZED FOR THE FLOW MEASUREMENTS MOST USEFUL FOR ASSESSING IR SUPPRESSOR PERFORMANCE, INCLUDING VELOCITY AND MIXING FLOW DIAGNOSITC TECHNIQUES. THE PROPOSED CFTS WILL BE DESIGNED TO SIMULATE THE EXHAUST FLOW OF THE CLASS OF TURBO-SHAFT ENGINES USED IN HELICOPTERS. A PHASE I WORK PLAN HAS BEEN DEVELOPED TO CCOMPLISH SEVERAL TECHNICAL OBJECTIVES NEEDED TO DEVELOP THE CFTS. THESE INCLUDE DEVELOPMENT OF SIMILARITY CONCEPTS FOR SCALING THE FLOW AND OF VALIDATION AND MEASUREMENT PROCEDURES AND DIAGNOSTICS TO PROVIDE A RELIABLE FOUNDATION FOR MAKIG USE OF THE ANTICIPATED TEST RESULTS.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
Program Manager: DR YONG-SHENG CHAO
Contract #:
Title: A DIRECTIONAL LASER SENSOR FOR EYE PROTECTION SYSTEMS
Topic #: A90-142 Office: AVSCOM ID #: 39588

AN INNOVATIVE, COMPACT AND FAST DIRECTIONAL LASER SENSOR BASED ON THE LATEST ACHIEVEMENTS IN PHOTODETECTION TECHNOLOGY IS PROPOSED. THE LASER SENSING DEVICE USES A SPHERE LENS AS A DIRECTION IDENTIFIER, WITH A WIDE (+OR-90 DEG) FIELD OF VIEW. AN INCIDENT LASER BEAM IS FOCUSED BY THE SPHERE LENS ONTO A HEMISPHERICAL, AMORPHOUS SILICON, POSITION SENSITIVE DETECTOR LOCATED AT OR NEAR THE FOCAL SURFACE. A TWO-DIMENSIONAL RESISTIVE ANODE READS THE SIGNAL CURRENT. A SIGNAL PROCESSING CIRCUIT PRODUCES A TRIGGER SIGNAL IN RESPONSE TO LASER ILLUMINATION. ADDITIONAL OUTPUT SIGNALS PROVIDE AN INDICATION OF THE POWER LEVEL AND DIRECTION OR ORIGIN OF THE LASER BEAM. THE OUTPUT SIGNALS ARE APPROPRIATE TO TRIGGER AND CONTROL THE EXECUTION PART OF A DYNAMIC EYE PROTECTION SYSTEM.

ELECTROIMPACT INC
2721 NE BLAKELEY ST
SEATTLE, WA 98105
Program Manager: JOHN HARTMANN
Contract #:
Title: CONFORMAL MAGNETIC REPAIR SYSTEM
Topic #: A90-143 Office: AVSCOM ID #: 39589

ADVANCED COMPOSITES INTRODUCE NEW CHALLENGES FOR FIELD REPAIR. THE IFEAL CONDITIONS FOR COMPOSITE REPAIR ARE TO EMPLOY HARD COOLING WITH CONSOLIDATION PRESSURE AND TEMPERATURE CONDITIONS SIMILAR TO AN AUTOCLAVE. NEITHER THE TOOLING NOR THE AUTOCLAVE ARE AVAILABLE IN THE FIELD. LAST YEAR IN COOPERATION WITH McDONNELL AIRCRAFT COMPANY ELECTROIMPACT BEGAN DEVELOPMENT OF A CONFORMAL MAGNETIC REPAIR SYSTEM (CMRS). CMRS USES A MATRIX OF PERMANENT MAGNETS AND RESISTANCE HEATERS ON EITHER SIDE OF THE REPAIR AREA TO APPLY HEAT AND PRESSURE TO A DAMAGED AREA. CMRS IS A SMALL LIGHTWEIGHT AND VERSATILE REPAIR TOOL. FOR FIELD REPAIR THE MOST SIGNIFICANT ADVANTAGE IS THAT THE ONLY SUPPORT EQUIPMENT REQUIRED FOR ITS OPERATION IS A SMALL AMOUNT OF ELECTRIC POWER. IN THE PHASE I PROGRAM THE SUITABILITY OF CMRS FOR MEETING THE ARMY ADVANCED COMPOSITE STRUCTURES REPAIR REQUIREMENTS WILL BE EVALUATED. IN THE PHASE I PROGRAM IN CONSULTATION WITH THE ARMY AND McDONNELL DOUGLAS HELICOPTER COMPANY A PART AND DAMAGE CONDITION WILL BE SELECTED. A DOZEN SIMILAR PARTS WILL BE FABRICATED, C-SCANNED BEFORE DAMAGE, AFTER DAMAGE AND AFTER REPAIR BY CMRS. REPAIR PARAMETERS WILL BE VARIED TO FURTHER EVALUATE THE TECHNOLOGY.

AURORA OPTICS INC
1777 SENTRY PK W - DUBLIN HALL/STE 408
BLUE BELL, PA 19422
Program Manager: LAURENCE N WESSON
Contract #:
Title: FIBER OPTIC PARTICULATE SENSOR FOR TURBOSHAFT GAS TURBINE ENGINES
Topic #: A90-144 Office: AVSCOM ID #: 39590

THE PERFORMANCE AND DURABILITY OF AIR-BREATHING ENGINES ARE SENSITIVE TO THE ENVIRONMENT IN WHICH THEY OPERATE. IN THE CASE OF TURBOMACHINERY OPERATING WITH PARTICULATE-LADEN AIR, VERY SERIOUS DEGRADATION OF ENGINE PERFORMANCE AND LIFE CAN OCCUR. THE OBJECTIVE OF THIS PROGRAM IS TO EVALUATE TWO PROMISING CONCEPTS FOR FIBER OPTIC SENSORS TO DETECT THE PRESENCE AND NATURE OF PARTICULATES ENTERING THE INTKAE OF AN OPERATING TURBOSHAFT ENGINE. BY USING FIBER OPTIC TECHNIQUES THE CONSIDERABLE ADVANTAGES OF PASSIVE OPERATION AND EMI IMMUNITY CAN BE REALIZED. WITH A PARTICULATE SENSOR OPERATING IN REAL TIME, AN INLET PARTICLE SERATOR (IPS) CAN BE SWITCHED OFF AND ON AS NEEDED. THIS, IN TURN, WILL CONVEY SIGNIFICANT BENEFITS IN ENGINE FUEL CONSUMPTION, ENGINE LIFE, AND COMPENSATION FOR ICING CONDITIONS. WITH GREATER THRUST AVAILABLE UNDER MOST (NON-DUSTY) CONDITIONS, IMPROVED AGILITY AND VEHICLE SAFETY CAN BE REALIZED. IN PHASE I, DESIGN STUDIES WILL IDENTIFY THE SYSTEM LAYOUT AND DESIGN PARAMETERS WHICH MUST BE ADDRESSED TO BEST INTEGRATE THE SENSOR ONTO A PRODUCTION ENGINE; EVALUATE THE TWO PROPOSED APPROACHES THEORETICALLY TO IDENTIFY THE BEST CANDIDATE FOR DEVELOPMENT; BUILD AND TEST A MODEL EMBODYING THE PREFERRED APPROACH; AND STUDY THE COST IMPACT OF INCORPORATING A SENSOR OF THIS TYPE ONTO AN ENGINE.

ADVANCED DECISION SYSTEMS
1500 PLYMOUTH ST
MOUNTAIN VIEW, CA 94043
Program Manager: HILARIE NICKERSON
Contract #:
Title: VISUALIZATION OF HEURISTIC PROCESSES

Topic #: A90-147 Office: AVSCOM ID #: 39591

RESEARCH INTO VISUALIZATION TECHNIQUES FOR HEURISTIC PROCESSES IS PROPOSED, INCLUDING THE DESIGN OF A SOFTWARE SYSTEM IN WHICH THESE TECHNIQUES ARE IMPLEMENTED. IN ADDITION TO THE SOFTWARE ARCHITECTURE, THE SYSTEM DESIGN WILL INCLUDE A DESCRIPTION OF USER INTERFACE FUNCTIONS AND A STRATEGY FOR INTERFACING WITH EXISTING ARTIFICIAL INTELLIGENCE APPLICATIONS. EXISTING WORK IN ALGORITHM ANIMATION AND IN THE TAXONOMIC CLASSIFICATION OF HEURISTIC PROCESSES WILL SUPPORT THE VISUALIZATION RESEARCH. THE RESULTING PRESENTATION METHODOLOGY WILL BE GENERALIZABLE, SUCH THAT A SET OF GUIDELINES FOR THE DISPLAY OF OTHER NON-QUANTITATIVE MODELS MAY BE PRODUCED. THE PROPOSED EFFORT INCLUDES AN EVALUATION OF HEURISTIC PROCESSING TAXONOMIES, A REVIEW OF METHODS AND SYSTEMS FOR ALGORITHM ANIMATION, DEVELOPMENT OF HEURISTIC PROCESS VISUALIZATION METHODS, AND GENERATION OF A DESIGN FOR A SOFTWARE SYSTEM INCORPORATING THE ABOVE RESULTS.

LITE-COM INC
20249 ELKWOOD ST
CANOGA PK, CA 91306
Program Manager: DR ROBERT FAN
Contract #:
Title: FIELD REPAIR TECHNIQUES AND EQUIPMENT FOR FIBER OPTIC
Topic #: A90-148 Office: AVSCOM ID #: 39592

THE DEPARTMENT OF THE ARMY HAS INDICATED A NEED FOR FIBER OPTIC FIELD REPAIR TECHNIQUES AND EQUIPMENT ESPECIALLY APPLICABLE TO USE WITH HELICOPTERS. THE PROPOSED FIBER OPTIC COMPONENTS AND TECHNIQUES FOR FIELD REPAIR ARE BASED ON THE DEVELOPMENT OF (1) DEFINITION OF REQUIREMENTS AND REPAIR METHODOLOGY FOR FIELD MAINTENANCE OF FIBER OPTIC CONNECTORS AND CABLES IN HELICOPTER APPLICATIONS. (2) ASSESS- MENT OF CURRENT MAINTENANCE TECHNIQUES AND TOOLS FOR ADEQUACY IN MEETING ARMY REQUIREMENTS. (3) DEVELOPMENT OF ADEQUATE MAINTENANCE PROCEDURES FOR USE IN ADVERSE ENVIRONMENT. (4) A NEW METHOD TO CONSTRUCT A FIBER OPTIC CLEAVE-AFTER-CRIMP FIELD TOOL TO REPAIR TERMINATION CONNECTORS. (5) A METHOD TO IMPROVE FIBER OPTIC FIELD SPLICING ASSEMBLY PROCEDURES FOR PURPOSES OF BETTER MAINTAINABILITY.

AURORA OPTICS INC
1777 SENTRY PK W - DUBLIN HALL/STE 408
BLUE BELL, PA 19422
Program Manager: LAURENCE N WESSON
Contract #:
Title: FIBER OPTIC COMPONENTS FOR TURBOSHAFT ENGINE CONTROL SYSTEMS
Topic #: A90-149 Office: AVSCOM ID #: 39593

MODERN TURBOSHAFT ENGINE CONTROL COMPONENTS ADDRESS SUCH PARAMETERS AS PRESSURE, TEMPERATURE, SHAFT SPEED, FUEL FLOW, AND THE POSITION OF VARIABLE GEOMETRY COMPONENTS. HOWEVER, ELECTRONIC CONTROL COM- PONENTS ARE SUSCEPTIBLE TO ELECTROMAGNETIC INTERFERENCE, AND SHIELDING CARRIES SUBSTANTIAL PENALTIES IN WEIGHT AND ENGINE COST. FIBER OPTIC ALTERNATIVE COMPONENTS CAN OFFER REAL ADVANTAGES IN WEIGHT AND EMI IMMUNITY, BUT CONSIDERABLE DEVELOPMENT IS REQUIRED TO REALIZE THESE BENEFITS IN A WORKING SYSTEM. TO ADDRESS THIS AREA, AURORA OPTICS AND TELEDYNE CAE PROPOSE TO IDENTIFY PROMISING ENGINE LOCATIONS FOR A PROTOTYPE SYSTEM ON A PRODUCTION ENGINE, RESOLVE INTEGRATION ISSUES RELEVANT TO THE INSTALLATION OF A FIBER OPTIC CONTROL SYSTEM ON THE ENGINE, EVALUATE SEVERAL VERY PROMISING SENSOR TECHNOLOGIES FOR DEMONSTRATION IN THE SYSTEM, SELECT A KEY TECHNOLOGY FOR EACH REQUIRED SENSOR POINT, AND DESIGN A COMPLETE DEMONSTRATION CONTROL SYSTEM. IN PHASE II, THE, THE CONTROL COMPONENTS WILL BE OBTAINED AND/OR DESIGNED AND BUILT;

ASSEMBLED INTO A COMPLETE CONTROL SYSTEM, INSTALLED ON A PRODUCTION ENGINE, AND TESTED IN PLACE. THE TECHNOLOGIES SUGGETED FOR EARLY CONSIDERATION FOR THE FIBER OPTIC CONTROL COMPONENTS ARE PHOTOELASTIC, MAGNETO-OPTIC, CODE PLATE, TWO-COLOR PYROMETRY, AND BACK REFLECTION.

SIMULA INC
10016 S 51ST ST
PHOENIX, AZ 85044
Program Manager: DR GERSHON YANIV
Contract #:
Title: FATIGUE EFFECTS OF THERMOPLASTIC HELICOPTER COMPONENTS WITH EMBEDDED DELAMINATIONS
Topic #: A90-150 Office: AVSCOM ID #: 39594

THE USE OF THERMOPLASTIC MATERIALS IN ROTOR COMPONENTS MAY SIGNIFICANTLY REDUCE THE PROBLEM OF DELAMINATIONS AND INCREASE FATIGUE LIFE. HOWEVER, LITTLE IS KNOWN OF THE EFFECT THAT MANUFACTURING FLAWS, IMPURITIES, AND VOIDS HAVE ON ROTOR THERMO- PLASTIC COMPONENTS STRENGTH AND STIFFNESS AFTER AN EXTENDED NUMBER OF FLIGHT HOURS. TWO MAIN OBJECTIVES ARE PROPOSED: (1) IDENTIFI- CATION OF CANDIDATE ROTOR COMPONENTS MOST LIKELY TO BENEFIT BY BEING FABRICATED FROM THERMOPLASTIC COMPOSITE MATERIALS, AND (2) GENERATION OF AN EXPERIMENTAL DATA BASE OF FATIGUE EFFECTS ON THERMOPLASTIC SPECIMENS WITH AND WITHOUT MANUFACTURING DEFECTS. A LITERATURE SURVEY WILL BE CONDUCTED TO FOCUS ON PROBLEMS SUCH AS LOCATIONS OF CRITICAL DELAMINATION AND IDENTIFICATION OF THE CANDIDATE COMPONENTS, CONVENIENCE OF FABRICATION OF CRITICAL ROTOR COMPONENTS WITH THERMOPLASTICS, AND BONDING/JOINING THEM WITH THE REST OF THE ROTOR PARTS. THE EXPERIMENTAL DATA BASE WILL BE GENERATED BY TESTING COUPONS. TO SIMULATE MANUFACTURING DEFECTS UPILEX-S(R) DISKS WILL BE EMBEDDED IN THE COUPONS. TENSION/TENSION FATIGUE S-N CURVES WILL BE CREATED FOR THREE THERMOPLASTIC MATERIALS WITH AND WITHOUT EMBEDDED DISKS TO DETERMINE THE RANGE OF THE CRITICAL DELAMINATION SIZE.

ELECTRO OPTIC CONSULTING SERVICES
18198 AZTEC CT
FOUNTAIN VALLEY, CA 92708
Program Manager: DR COLLEEN M FITZPATRICK
Contract #:
Title: AN IMPROVED METHOD OF HOLOGRAPHIC NONDESTRUCTIVE INSPECTION OF METAL MATRIX COMPOSITES FOR GAS TURBINE ENGINES
Topic #: A90-151 Office: AVSCOM ID #: 39595

THE AIM OF THIS PROJECT IS TO DETERMINE THE FEASIBILITY OF A NOVEL, REAL TIME, HOLOGRAPHIC INTERFEROMETRIC TECHNIQUE IN THE SUBSURFACE INSPECTION OF METAL MATRIX COMPOSITE PARTS IN GAS TURBINE ENGINES. THE INTENT IS TO USE COMMON PATH, PHASE SHIFT TECHNIQUES TO ENHANCE THE SENSITIVITY OF HOLOGRAPHIC INTERFEROMETRY TO FLAW DETECTION AND BOND CHARACTERIZATION, WHILE AT THE SAME TIME, MINIMIZING THE INFLUENCE OF THE TECHNIQUE ON HEALTHY, WELL-FORMED AREAS. A THERMOPLASTIC CAMERA WILL BE USED TO RECORD THE HOLOGRAMS, SINCE IT IS CAPABLE OF IN SITU DEVELOPMENT AND LATER ERASURE FOR REUSE. SPECIMENS OF TITANIUM ALUMINIDE MATERIAL WILL BE OBTAINED, BOTH HEALTHY, AND WITH PROGRAMMED DEFECTS, AND A COMPARISON WILL BE MADE OF THE TWO TYPES OF RESULTING INTERFEROGRAMS. THE OUTCOME OF THE PHASE I RESEARCH EFFORT WILL BE AN ASSESSMENT OF THE TECHNIQUE IN LOCATING FLAWS IN THE COMPOSITE MATERIALS, AND A SET OF DEFINED RECOMMENDATIONS FOR THE DEVELOPMENT IN PHASE II OF AN AUTOMATED VERSION OF THE DEVICE FOR COMMERCIAL APPLICATION. THE LONG-TERM OBJECTIVE OF EOCS IS THE COMMERCIALIZATION OF THIS DEVICE FOR USE IN THE MILITARY AND AEROSPACE INDUSTRIES.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
Program Manager: LARRY D HANKE
Contract #:
Title: A NEW SEMI-AUTOMATIC SCRIBER (SAS) FOR RAPID INSPECTION OF BEARING COMPONENTS
Topic #: A90-152 Office: AVSCOM ID #: 39596

THIS SBIR PROPOSAL DEFINES AN INNOVATIVE APPROACH FOR AUTOMATING CURRENT METHODS USED FOR BEARING INSPECTION. THE PROPOSED SEMI-AUTOMATED SCRIBER (SAS) WILL RELY ON AN INSTRUCTED PROBE COUPLED TO A PC-BASED DATA ACQUISITION SYSTEM. IN THE FIRST TASK OF THE PROCESS, A SIMPLIFIED VERSION OF THIS PROBE WILL BE CONSTRUCTED AND USED ON KNOWN DEFECT TYPES AND GEOMETRY TO HELP EVALUATE THE TEST METHODS AND DATA THAT YIELD THE MOST CONSISTENT RESULTS. BASED ON THE RESULTS OF THE FIRST TASK, THE ACTUAL PROTOTYPE WILL BE DESIGNED TO DIGITIZE THE SCRIBER PROBE SIGNALS. USING THE NEW PROTOTYPE SAS, A COMPUTERIZED DATABASE OF DEFECT SIGNATURES WILL BE DEVELOPED FROM BEARINGS KNOWN TO BE UNACCEPTABLE. THESE DEFECT SIGNATURES WILL PROVIDE THE NECESSARY DATA TO DEVELOP ACCEPT/REJECT CRITERIA. GIVEN THE ACCEPT/REJECT CRITERIA, A SET OF TEST BEARINGS WILL BE EXAMINED TO DEMONSTRATE THE ADEQUACY AND ACCURACY OF THE NEW APPROACH.

TECHNOLOGY INTEGRATION & DEV GP INC
ONE PROGRESS RD
BILLERICA, MA 01821
Program Manager: NATHAN B HIGBIE
Contract #:
Title: PROGNOSTIC METHODS FOR ROTORCRAFT CONDITION MONITORING
Topic #: A90-153 Office: AVSCOM ID #: 39597

PROGNOSTIC METHODS (TIME TO FAILURE PREDICTION) REQUIRE KNOWLEDGE OF FAILURE MODES, EARLY DETECTION OF CHANGE, AND LEARNING FROM EXPERIENCE. IN PREVIOUS AND ONGOING GOVERNMENT SUPPORTED RESEARCH, TIDG HAS PROVEN TECHNIQUES FOR EARLY FAULT DETECTION OF ROTORCRAFT MECHANICAL FAULTS AND IS CURRENTLY WORKING ON INTEGRATING MACHINE LEARNING TECHNOLOGY INTO THE DESIGN FOR AN ONBOARD MONITORING SYSTEM. RESEARCH INTO PROGNOSTIC TECHNIQUES INTEGRATES INTO THESE ONGOING PROGRAMS, CREATING A SYNERGY WHERE FUNDED RESEARCH CAN BE MUCH MORE EFFICIENT. IN THIS PHASE I PROGRAM, WE PROPOSE TO IMPLEMENT TREND- BASED PROGNOSTIC ALGORITHMS ON OUR IMADS HELICOPTER MACHINERY MONITORING SYSTEM (AS INSTALLED AT NADEP, PENSACOLA, AND AT TIDG), PERFORM RIG TETS ON BEARINGS, SINCE EARLY FAULT DETECTION ALGORITHMS ARE PROVEN, AND TO INTEGRATE MONITORING MACHINE LEARNING TECHNOLOGY, BEING DEVELOPED IN OTHER PROGRAMS, INTO THE PROGNOSTIC ALGORITHM DEVELOPMENT. THIS WILL RESULT IN AN INTEGRATED APPROACH TO A ROTORCRAFT MONITORING SYSTEM.

INSTITUTE OF MEDICAL CYBERNETICS INC
3993 HUNTINGDON PIKE - STE 104
HUNTINGDON VALLEY, PA 19006
Program Manager: YAN YUFIK
Contract #:
Title: A TECHNIQUE TO ASSESS THE COGNITIVE COMPLEXITY OF MAN-MACHINE INTERFACE
Topic #: A90-154 Office: AVSCOM ID #: 39598

IMC PROPOSES TO DEVELOP AN INNOVATIVE APPROACH TO THE PROBLEM OF DETERMINING THE COGNITIVE COMPLEXITY OF MAN-MACHINE INTERFACES, INCLUDING THE FOLLOWING: 1. COMPUTATIONAL TECHNIQUES FOR DERIVING CONCEPTUAL MODELS FROM THE SYSTEM FUNCTIONAL SPECIFICATIONS, AND PREDICTING MODEL EVOLUTION IN THE COURSE OF OPERATOR TRANING. 2.

METHODS FOR MEASURING MODEL INFORMATION-BASED COMPLEXITY. 3. METHODS FOR DETERMINING SYSTEM FEATURES RESPONSIBLE FOR COMPLEXITY. THE RESEARCH IS PREDICATED ON THE HYPOTHESES THAT (a) COGNITIVE COM- PLEXITY OF THE MAN-MACHINE INTERFACE DEPENDS ON THE STRUCTURE OF OPERATOR MENTAL MODELS CAPTURING REGULARITY OF PATTERNS IN THE CONTROLLED SYSTEM BEHAVIOR, (b) THAT MODELS CAN BE REPRESENTED AS DIRECTED WEIGHTED GRAPHS, (c) THAT EVOLUTION OF MODELS INVOLVES FORMATION OF GESTALTS, OR COHESIVE STRUCTURAL COMPONENTS WITHIN THE GRAPHS, AND (d) THAT COGNITVE COMPLEXITY DEPENDS ON THE TOPOLOGY OF THE EVOLVING STRUCTURES. PHASE I INCLUDES FEASIBILITY ASSESSMENT OF THE PROPOSED METHODS, IMPLEMENTATION DESCRIPTION, AND A DETAILED DEFINITION OF COGNITIVE COMPLEXITY WITH EMPHASIS ON MULTIFUNCTION DISPLAYS.

RETICULAR SYSTEMS INC
4095 CALGARY AVE
SAN DIEGO, CA 92122
Program Manager: DAN R BALLARD
Contract #:
Title: D/NAPS SITUATION ASSESSMENT BY PLAN ASSUMPTION MONITORING
Topic #: A90-155 Office: AVSCOM ID #: 39599

SCOUT/ATTACK HELICOPTER PILOTS CAN EASILY BE OVERLOADED WITH TOO MUCH INFORMATION, ESPECIALLY AT NIGHT AND/OR IN ADVERSE WEATHER. INTELLIGENT SYSTEMS WHICH REDUCE PILOT WORKLOAD ARE REQUIRED; A MAJOR COMPONENT OF AN INTELLIGENT SYSTEM IS SITUATION ASSESSMENT (SA), ALLOWING COMPLEX MISSIONS TO BE PERFORMED WITHOUT REQUIRING A COPILOT. THE SA FUNCTIONS MUST PROVIDE A PROBLEM-SOLVING PARADIGM WHICH CAN REASON ABOUT THE STATE OF THE AIRCRAFT AND THE PILOT IN A RAPIDLY CHANGING, UNCERTAIN WORLD. THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP AN ARCHITECTURE, AND DESCRIBED A KNOWLEDGE BASED AND PROCESSING SYSTEM, WHICH USES PILOT KNOWLEDGE TO PERFORM SITUATION ASSESSMENT. A DESIGN DESCRIPTION FOR A SUBSET OF THE KNOWLEDGE BASE REQUIRED FOR SA FOR D/NAPS WILL BE PRODUCED. THIS KNOWLEDGE-BASED SYSTEM WILL REASON ABOUT AND ADAPT TO THE ENVIRONMENT. USING RULES, FACTS AND HEURISTICS ABOUT PILOTAGE, MISSION, VEHICLE STATUS, ETC., ELICITED FROM OUR SCOUT/ATTACK HELICOPTER PILOT, WE WILL CONSTRUCT A KNOWLEDGE BASE FOR CONTINUOUSLY MONITORING THE STATE OF THE IRCRAFT AND ITS ENVIRONMENT AND ASSESS THE STATUS OF THE ON-GOING MISSION. THIS DESIGN WILL USE A RULE-BASED PROCESS TERMED SITUATION ASSUMPTION MONITORING (SAM). THE PROPOSED DESIGN CAN BE EXTENDED TO MEET REAL-TIME PERFORMANCE REQUIREMENTS, REASON UNDER UNCERTAINTY AND EXPLAIN ITS DECISION-MAKING RATIONALE.

MADISON RESEARCH INC
37 WINDING WY
MADISON, NJ 07940
Program Manager: P M ANDERSON
Contract #:
Title: THREE TORQUE SENSOR CONCEPTS
Topic #: A90-157 Office: AVSCOM ID #: 39600

TO REDUCE THE LOAD ON THE COMBINING TRANSMISSIONS IN TWO ENGINE TURBOSHAFT HELICOPTERS, THE TORQUE MUST BE LEVELED. IT IS PROPOSED TO UNDERTAKE: TO EVALUATE THREE CONCEPTS OF A TORQUE SENSOR FOR TURBOSHAFT ENGINES, INCLUDING THEIR SENITIVITY, LINEARITY, AND ACCURACY; SELECTION OF THE BEST CONCEPT FOR DETAILED DESIGN, INCLUDING A BLOCK DIAGRAM OF ITS ASSOCIATED ELECTRONICS. TWO CONCEPTS MAKE USE OF A SELF-CONTAINED COLLAR THAT IS ATTACHED TO THE SHAFT IN SITU. IN ONE CONCEPT, A TRADITIONAL STRAIN GAGE BRIDGE IS MOUNTED WITHIN THE COLLAR WITH AN RF ANTENNA AND AN ELECTRONICS MODULE. IN THE SECOND CONCEPT, AMORPHOUS ALLOY RIBBONS ARE BONDED TO THE OUTSIDE OF THE COLLAR: ALONG THE LINE OF COMPRESSION ON ONE SECTION OF THE SLEEVE; AND ALONG THE LINE OF TENSION ON ANOTHER SECTION

OF THE SLEEVE. A STATIONARY DRIVE/PICKUP COIL IS MOUNTED AROUND AND AWAY FROM THE COLLAR. THE THIRD CONCEPT UTILIZES A REFLECTANCE GRATING, LASER DIODE, AND CCD ARRAY TO OPTICALLY DETERMINE SHAFT TORQUE. THESE CONCEPTS ARE EXPECTED TO RESULT IN HIGHLY ACCURATE SENSORS THAT WILL NOT REQUIRE INDIVIDUAL CALIBRATION AT INSTALLATION, AND WILL BE ROBUST AND EASY TO MAINTAIN.

ECODYNAMICS RESEARCH ASSOCS INC
PO BOX 8172
ALBUQUERQUE, NM 87198
Program Manager: DR PATRICK J ROACHE
Contract #:
Title: DYNAMIC STALL CONTROL
Topic #: A90-158 Office: AVSCOM ID #: 39601

COMPUTATIONAL ALGORITHMS AND CODE WILL BE DEVELOPED FOR CALCULATING UNSTEADY COMPRESIBLE 3-D VISCOUS FLOW AND RETREATING-BLADE DYNAMIC STALL ON MODERN HIGH-PERFORMANCE HELIOPTER ROTORS. THE ALGORITHM DEVELOPMENT WILL START FROM AN EXISTING 3-D TIME DEPENDENT VISCOUS COMPRESSIBLE CODE ALREADY USED SUCCESSFULLY TO CALCULATE PERIODIC PITCHING OF A SWEPT WING SECTION MOUNTED IN A WIND TUNNEL TEST SECTION. THE CODE USES AN APPROXIMATE FACTORIZATION (AF) ALGORITHM (INCLUDING CROSS DERIVATIVE TERMS) IN A MOVING BOUNDARY FITTED CORDINATE SYSTEM WITH SOLUTION ADAPTIVE GRID GENERATION ALGORITHMS, AND IS HIGHLY VECTORIZED FOR THE CRAY-2. THE NEW CODE WILL INCLUDE THE MORE DIFFICULT GEOMETRY DESCRIPTION OF A FINITE SPAN WING, AND TURBULENCE MODELING FOR STRONGLY SEPARATED FLOWS INCLUDING CENTRI- FUGAL FORCES. THE PHASE II CODE WILL ALSO BE APPLICABLE TO COMPLEX MOTIONS AND TO FULLY COUPLED AEROELASTICITY CALCULATIONS.

STATISTICA INC
30 W GUDE DR - STE 300
ROCKVILLE, MD 20850
Program Manager: BARRIE S BASTON
Contract #:
Title: ADA PROGRAMMING SUPPORT ENVIRONMENT (APSE) DEFINITION
Topic #: A90-159 Office: AIRMICS ID #: 39602

THE OBJECTIVE OF THIS TASK IS TO DEFINE ONE OR MORE APSE(S) FOR THE AIRMICS COMMAND BASED ON THE DEVELOPMENT, ENHANCEMENT, AND MAINTENANCE CHARACTERISTICS FOR MANAGEMENT INFORMATION SYSTEMS (MISs). APSE(S) WILL BE FORMED FOR THESE THREE MAJOR DOMAINS, WITH EMPHASIS ON LARGE, MEDIUM, AND SMALL SYSTEMS. DURING PHASE I, RESEARCH IS PERFORMED TO IDENTIFY EXISTING CASE TOOLS, ENVIRONMENTS, METHODOLOGIES, AND A PROTOTYPE "HOW THEY ALL FIT TOGETHER" DATABASE SYSTEM. THE PROTOTYPE DATABASE SYSTEM WILL ENABLE THE AUTOMATED SELECTION OF AN APPROPRIATE APSE(S) FOR A SPECIFIED MIS/"BUSINESS DATA PROCESSING" DOMAIN AND THEN ASSOCIATE SPECIFIC TOOLS AND METHODS WITH THIS APSE(S). pHASE II WILL BE TO DEMONSTRATE THE SELECTED APSE(S) AND UPGRADE THE PROTOTYPE DATABASE SYSTEM TO AN OPERATIONAL SYSTEM.

AI WARE INC
11000 CEDAR AVE
CLEVELAND, OH 44106
Program Manager: DR YOH-HAN PAO
Contract #:
Title: NEURAL NETWORK APPLICATIONS IN MILITARY PROCUREMENT LOGISTICS OPERATIONS INTELLIGENCE AND TRAINING
Topic #: A90-160 Office: AIRMICS ID #: 39604

MANY COMPELLING EIS/ESS APPLICATIONS IN THE MILITARY AND IN INDUSTRY REMAIN INFEASIBLE DUE TO LIMITATIONS IN COMPUTER TECHNOLOGY. MANY INTERESTING PROBLEMS ARE TOO LARGE OR TOO COMPLEX FOR PRACTICAL SOLUTIONS BY TRADITIONAL APPROACHES. THE COMPLEXITY MAY ARISE FROM UNKNOWN, NON-LINEAR, OR TIME-VARYING RELATIONSHIPS BETWEEN VARIABLES. NEURAL NETWORK TECHNOLGY HAS DEMONTRATED SIGNIFICANT CAPABAILITIES IN SIMILAR APPLICATIONS. NEURAL NETS "LEARN BY EXAMPLE", PROVIDING ADAPTIVE CAPABILITIES UNLIMITED BY THE PROBLEM SIZE OR THE NATURE OF RELATIONSHIPS BETWEEN VARIABLES. THESE CAPABILITIES MERIT INVESTI- GATION IN THE CONTEXT OF ARMY EIS/ESS APPLICATIONS. WE WILL EXPLORE POTENTIAL APPLICATIONS IN THE FOLLOWING AREAS: MILITARY PROCUREMENT, LOGISTICS, OPERATIONS, INTELLIGENCE, AND TRAINING. WE WILL QUALIFY THESE APPLICATIONS ON THE BASIS OF TECHNICAL FEASIBILITY, RESOURCE REQUIREMENTS, AND BENEFITS TO THE ARMY AND THE INTENDED USER. WE HOPE TO THEN PREPARE PHASE II PROPOSALS FOR IMPLEMENTATION OF THE MOST COMPELLING APPLICATIONS.

HNC INC
5501 OBERLIN DR
SAN DIEGO, CA 92121
Program Manager: WILLIAM R CAID
Contract #:
Title: APPLICATION OF NEURAL NETWORKS FOR THE EXTRACTION AND CHARACTERIZATION OF KNOWLEDGE CONTAINED IN DATABASES
Topic #: A90-160 Office: AIRMICS ID #: 39603

LRGE DATABASES EXIST FOR USE BY MILITARY COMMANDERS AND EXECUTIVE DECISION-MAKERS. CONVENTIONAL TECHNOLOGY DOES NOT EASILY ALLOW THE EXTRACTION OR DISTILLATION OF THE KNOWLEDGE CONTAINED WITHIN THESE DATABASES. AS A CONSEQUENCE, MOST OF THE TRUE POWER OF THIS INFORMATION IS INEFFICIENTLY UTILIZED. HNC HAS DEVELOPED THE ABILITY TO CHARACTERIZE, EXTRACT, AND EXPLOIT KNOWLEDGE CONTAINED WITHIN DATABASES USING NEURAL NETWORK TECHNIQUES. THIS CAPABILITY HAS BEEN DEMONSTRATED ON COMMERCIAL SECTOR DATABASES, AND IS CALLED "KNOWLEDGE EXTRACTION USING NEURAL NETWORKS" (KENN). KENN CAN DISCOVER UNKNOWN RELATIONSHIPS CONTAINED WITHIN DATABASES, AND CAN DEVELOP COMPLEX NON-LINEAR MODELS OF THESE RELATIONSHIPS WITH NO PROGRAMMING AND MINIMAL USER INTERACTION. KENN IS EXTREMELY POWERFUL AND MAJOR PORTIONS OF THE TECHNOLOGY EXIST. HOWEVER, THE MOST POWERFUL COMPONENT OF KENN, RELATIONSHIP DISCOVERY, HAS ONLY BEEN DEMONSTRATED ON A PROOF-OF-CONCEPT BASIS. THIS PROPOSAL DESCRIBES THE EXISTING KENN TECHNOLOGY AND OFFERS A PLAN FOR THE ENHANCEMENT OF THE RELATIONSHIP DISCOVERY COMPONENT OF KENN WITH SPECIFIC EMPHASIS TO ARMY EXECUTIVE INFORMATION SYTEM (EIS) PROCESSING REQUIREMENTS. COMPLETION OF THIS PROPOSED EFFORT WILL RESULT IN AN EXTREMELY POWERFUL, AUTOMATED EIS TOOL TO ASSIST DECISION MAKING PROCESSES.

TETRA CORP
4905 HAWKINS NE
ALBUQUERQUE, NM 87109
Program Manager: WILLIAM M MOENY
Contract #:
Title: EFFICIENT LASER PAINT REMOVAL AND RESIDUE DISPOSAL SYSTEM
Topic #: A90-162 Office: CERL ID #: 39605

ONE OF THE SIGNIFICANT ISSUES IN THE REFURBISHMENT AND MAINTENANCE OF ARMY EQUIPMENT AND FACILITIES IS THE REMOVAL, HANDLING, AND DISPOSAL OF PAINT USED TO PROTECT THE BUILDINGS AND FACILITIES. PARTICULARLY IN THE CASE OF LEAD-BASED PAINT, IT IS IMPORTANT THAT THE RESIDUE NOT ENETER INTO THE ATMOSPHERE OR CONTAMINATE THE WORKERS REMOVING THE COATING. AT TETRA CORPORATION WE HAVE RECENTLY COMPLETED DEVELOPMENT OF A NEW TYPE OF REPETITIVE PULSED HIGH ENERGY ELECTRIC DISCHARGE CO2 LASER FOR DOD. THIS PROPOSAL IS TO APPLY THIS RECENTLY

DEVELOPED LASER TECHNOLOGY TO THE ARMY'S PROBLEM OF REMOVING PAINT FROM BUILDINGS AND FACILITIES IN PARTICULAR, BUT ALSO VEHICLES AND EQUIPMENT. THE SYSTEM WILL 1) PROVIDE EFFICIENT REMOVAL OF PAINT FROM FLAT AND COMPLEX-SHAPED SURFACES WITH REPETITIVE CO2 LASER PULSES, 2) WILL COLLECT THE PAINT RESIUDE, AND 3) WILL PROTECT THE OPERATOR AND ANY OBSERVERS FROM EXPOSURE TO THE SCATTERED LASER LIGHT. THE OVERALL TECHNICAL OBJECTIVES OF THE PHASE I EFFORT ARE TO DETERMINE THE PRACTICAL FEASIBILITY OF THE PAINT REMOVAL CONCEPT. THE SPECIFIC OBJECTIVES ARE TO DETERMINE THE LASE PULSE ENERGY DENSITY, PULSE TEMPORAL SHAPE, AND PEAK POWER DENSITY REQUIREMENTS FOR EFFICIENT PAINT REMOVAL AS A FUNCTION OF THE PAINT TYPE AND THICKNESS AND TO DEVELOP A CONCEPTUAL DESIGN AND ECONOMIC ANALYSIS OF AN OPERATIONAL SYSTEM TO DETERMINE THE PRACTICAL FEASIBILITY OF THE SYSTEM. BY COMPLETING THESE OBJECTIVES, WE WILL HAVE DETERMINED THE FEASIBILITY OF THE CONCEPT AND LAID THE FOUNDATION FOR THE SUCCESSFUL PROTOTYPE DEVELOPMENT AND DEMONSTRATION IN PHASE II.

EN-TECHNOLOGY INC
615 LINDSAY ST - STE 350
CHATTANOOGA, TN 37403
Program Manager: JEROME P HARPER
Contract #:
Title: DEVELOPMENT AND TESTING OF PIPE DETECTOR NETWORK FOR VENTILATION EFFECTIVENESS
Topic #: A90-163 Office: CERL ID #: 39606

THE PIPE (POCKET-SIZED, INTELLIGENT, PORTABLE, ENVIRONMENT) DETECTOR AND NETWORK IS A FLEXIBLE VENTILATION EFFECTIVENESS TESTING TECHNOLOGY FOR QUANTIFYING SPATIAL AND TEMPORAL VARIATIONS IN TEMPERATURE, HUMIDITY, AIR MOVEMENT, AND CONTAMINANT OR TRACER GAS DECAY, AS THEY ARE AFFECTED BY HVAC OPERATION OR OCCUPANCY. THE KEY ELEMENT IS THE PIPE DETECTOR WHICH HAVE FOUR ON-BOARD ENVIRONMENTAL SENSORS, INTELLIGENT CONTROLS, MEMORY, INDEPENDENT POWER, AND RF COMMUNICATIONS CAPABILITIES. THE DETECTORS ARE NETWORKED IN THE WORKPLACE ENVIRONMENT TO PROVIDE A NONINTRUSIVE NEAR-REAL TIME MONITORING SYSTEM OF THERMAL COMFORT, AIR MOVEMENT, AND CONTAMINANT REMOVAL. PIPE DETECTOR NETWORK CAN BE USED TO ASSESS OCCUPANCY OR PERSONAL ENVIRONMENTAL EXPOSURES. A MICROCOMPUTER WITH RF TRANSCEIVER PROVIDES NETWORK CONTROL.

PATHFINDER INC
PO BOX 5027 - 11 ALLISON DR
CHERRY HILL, NJ 08034
Program Manager: LOUIS J CABANO
Contract #:
Title: DESIGN FEATURES BASED PROJECT DATA ORGANIZATION MODEL
Topic #: A90-164 Office: CERL ID #: 40094

THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO TEST THE FEASIBILITY OF DEVELOPING PRACTICAL AND USEFUL COMPUTERIZED MODELS WHICH, GIVEN THEDESIGN FEATURES (PHYSICAL ATTRIBUTES) OF A PARTICULAR TYPE OF PROJECT WOULD AUTOMATICALLY DERIVE THE ARRAY OF KEY PROJECT DATA (IMPLEMENTATION FUNCTION/ACTIVITIES) ASSOCIATED WITH ITS EXECUTION. THE EFFORT WILL EXAMINE THE "BODY OF KNOWLEDGE" AVAILABLE TO PROVIDE THE RELATIONAL DATA BASES NEEDED TO ACHIEVE THIS OBJECTIVE AT VARIOUS STAGES OF PROJECT MATURITY. PHSE I WILL ATTEMPT TO DEMONSTRATE AND VERIFY QUALITATIVELY THAT THE CONCEPT IS FEASIBLE BY PRODUCING A GENERIC CONSTRUCTION PROJECT MODEL WHICH WILL BE VALIDATED BY TESTING AGAINST THE RESULTS OF ONE OR MORE COMPLETED PROJECTS. PATHFINDER, INC. HAS BEEN WORKING ON THE FUNDAMENTALS OF THIS CONCEPT FOR SEVERAL YEARS AND INTENDS TO BUILD UPON WORK IN PROGRESS TO EXPEDITE A SUPPORTABLE, FEASIBLITY CONCLUSION. IF PHASE I RESULTS ARE POSITIVE, THIS INITIAL EFFORT WILL INCLUDE A DEFINTIVE PROGRAM FOR PHASE II. DURING PHASE II, WE WOULD EXPECT TO ADD QUANTIFICATION

CAPABILITY TO THE PHASE I MODEL AND DEVELOP A PROTOTYPE COMMERCIAL COMPUTER PROGRAM. BASED ON PATHFINDER'S EXTENSIVE EXPERIENCE IN THE CONSTRUCTION INDUSTRY, WE BELIEVE WELL-DESIGNED PROGRAM OF THE TYPE BEING INVESTIGATED WOULD HAVE WIDESPREAD INTEREST AND COULD SIGNIFICANTLY IMPROVE THE SUCCESS POTENTIAL OF MANY CONSTRUCTION PROJECTS.

ATEK DATA CORP
2300 CANYON BLVD
BOULDER, CO 80302
Program Manager: GEOFFREY E HILL
Contract #:
Title: MEASUREMENT OF ICE ACCRETION AND PERSISTANCE AT UNMANNED SITES
Topic #: A90-165 Office: CERRL ID #: 39608

A SIMILAR METHOD TO MEASURING ICE ON A VIBRATING WIRE IS USED TO MEASURE PERSISTENT ICE ON SMALL STRUCTURES. THE MEASURMENT OF VIBRATION OF STRUCTURAL MEMBERS WILL UTILIZE AN ACCELEROMETER; IT PRODUCES A VERY SENSITIVE RESULTS FOR A WIDE DYNAMIC RANGE OF ATTACHED ICE MASS. A SMALL TAPPING MECHANISM WILL BE DEVELOPED TO INDUCE FREQUENCY VIBRATION. SIGNAL CONDITIONING AND PROCESSING ARE PROPOSED, INCLUDING USE OF A MICRO-CONTROLLER, A CRYSTAL CONTROLLED WAVE-LENGTH TIMER AND OTHER APPROACHES. PHASE I WILL CONSIST OF SEVERAL PRIMARY STEPS; 1) SELECTING APPROPRIATE ACCELEROMETERS(S) FOR A VARIETY OF STRUCTURAL MATERIALS TO BE TESTED; 2) ANALYZING THE VARIOUS OPTIONS FOR SIGNAL PROCESSING; 3) SELECTING APPROPRIATE POWER DEVICES; AND 4) PERFORMING BASIC TESTS TO ESTABLISH THE TECHNIQUE AND TO CLEARLY IDENTIFY THE ADDITIONAL RESEARCH NEEDED TO MKE THE PRODUCT COMMERCIALLY VIABLE. A WORKING SYSTEM AND A FINAL REPORT WILL BE PROVIDED.

FRANKLIN ENGINEERING CO INC
1902 LONGSHORE DR
ANN ARBOR, MI 48105
Program Manager: CHARLES H FRANKLIN
Contract #:
Title: ICE ACCRETION AND PERSISTENCE AT UNMANNED SITES
Topic #: A90-165 Office: CERRL ID #: 39607

THIS PROPOSAL CONCERNS THE DESIGN, FABRICATION AND TESTING OF A VERSATILE INSTRUMENT FOR THE CONTINUOUS COLLECTION AND WEIGHING OF ICE ACCRETION IN REMOTE REGIONS. THE INSTRUMENT USES A LOAD CELL THAT WILL MEASURE ICE LOAD ACCUMULATIONS ON A VERTICALLY ORIENTATED MAST ADAPTED TO IT. THE LOAD CELL BASE STRUCTURE IS PROTECTED FROM ICE ACCRETIONS THAT WOULD BRIDGE TO THE COLLECTION MAST AND FOUL MEASUREMENTS BY A ELASTOMERIC DE-ICER BOOT. THE DESIGN INCORPORATES A METHOD FOR MOMENTARILY LIFTING THE MAST LOAD FROM THE LOD CELL TO ESTABLISH A ZERO CALIBRATION BEFORE ICE WEIGHT MEASUREMENT. THIS WOULD OCCUR EACH TIME THE DE-ICER BOOT IS ACTUATED. CAPACITY SENSORS LOCATED UNDER THE DE-ICER BOOT ARE PROPOSED AS AN ICE DETECTOR TO MONITOR ICE ACCRETIONS ON THE LOAD CELL BASE. IF PROPERLY LOCATED THESE SENSORS MAY AUGMENT THE MAST WEIGHT MEASUREMENTS WITH THE AZIMUTHAL DIRECTION OF THE OCCURRING ACCRETIONS TO SAVE ENERGY, DETERMINE DE-ICER BOOT ACTUATION PERIODS. THE INSTRUMENT WILL EMPLOY ELECTRONICS AND COMPUTER HARDWARE, TOGETHER WITH SOFTWARE PROGRAMS TO MANAGE THE INSTRUMENT, STORE AND RELAY DATA.

ADVANCED DECISION SYSTEMS
1500 PLYMOUTH ST
MOUNTAIN VIEW, CA 94043
Program Manager: DR TIM J PATTERSON
Contract #:

Title: AUTOMATED SAR CHANGE DETECTION FOR COMBAT SUPPORT
Topic #: A90-166 Office: ETL ID #: 39609

ADS PROPOSES TO ADAPT AND APPLY CHANGE DETECTION PROCESURES DEVELOPED FOR THE NATIONAL INTELLIGENCE COMMUNITY TO THE PROBLEM OF SUPPORT FOR THE BATTLEFIELD COMMANDER. WE WILL BE WORKING WITH BOTH OF THE DOMINANT CHANGE DETECTION PARADIGMS WITH BOTH PIXEL LEVEL AND SYMBOLIC CHANGE DETECTION AND DETERMINING WHICH OF THE TWO OR POSSIBLE HYBRIDIZATION WILL PROVIDE THE BEST SHORT TERM CHANGE DETECTION.

VEXCEL CORP
2477 - 55TH ST
BOULDER, CO 80301
Program Manager: DR W KOBER
Contract #:
Title: AN AUTOMATED SOFTWARE SYSTEM FOR UPDATING DIGITAL TERRAIN DATA BASES FROM ALL-SOURCE IMAGERY
Topic #: A90-167 Office: ETL ID #: 39610

VEXCEL CORPORATION, TOGETHER WITH SPACE COMPUTER CORP., PROPOSES A PHASE I RESEARCH EFFORT DIRECTED TOWARD THE DERIVATION OF REQUIREMENTS ANALYSES AND ALGORITHMIC EXPLORATIONS NECESSARY FOR THE DEVELOPMENT OF AN AUTOMATED DIGITAL SYSTEM CAPABLE OF DETECTING LONG-TERM (6 MONTHS TO A YEAR) AND/OR SEASONAL CHANGES FROM ALL- SOURCE IMAGERY. THIS SYSTEM IS INTENDED TO BE HOSTED ON A SUN-4 PLATFORM, OPERATING UNDER A UNIX/C SOFTWARE ENVIRONMENT. THE TECHNICAL OBJECTIVES ARE CONCERNED WITH PRECISION IMAGE-IMAGE AND IMAGE-MAP REGISTRATION, AND ROBUST CHANGE DETECTION AND ANALYSIS.

L N K CORP
6811 KENILWORTH AVE - #306
RIVERDALE, MD 20737
Program Manager: DAVID LAVINE
Contract #:
Title: NEURAL NETWORKS FOR OBJECT DETECTION FROM ALL-SOURCE IMAGERY
Topic #: A90-168 Office: ETL ID #: 39611

LNK PROPOSES TO STUDY THE APPLICATION OF NEURAL NETWORKS TO OBJECT DETECTION FROM ALL-SOURCE IMAGERY. IN PHASE I EXISTING ARTIFICIAL NEURAL NETWORKS (ANNs) WILL BE EVALUATED ON OBJECT DETECTION PROBLEMS. THE STRENGTHS AND SHORTCOMINGS OF THESE TECHNIQUES WILL BE ASSESED AND NEW ANNS WILL BE DEVELOPED AS NECESSARY. AMONG THE TYPES OF NEW ANNs TO BE CONIDERED ARE HYBRID MODELS, WHICH MAY CONTAIN SEVERAL EXISTING OR NEW TYPES OF NEURAL NETWORKS, LINKED TOGETHER TO ENABLE SPECIFIC TYPES OF ANNs TO BE TAILORED TO PARTS OF A PROBLEM FOR WHICH THEY ARE MOST SUITABLE. IN ORDER TO USE IMAGERY FROM MULTIPLE SOURCES, THE IMAGERY MUST BE REGISTERED. LNK HAS DEVELOPED REGISTRATION TECHNIQUES FOR MATCHING IMAGES FROM DISSIMILAR SENSORS AND FOR MATCHING IMAGES AND MAPS. THESE TECHNIQUE WILL BE EMPLOYED AS NECESARY IN THE SYSTEM. IN PHASE II A USEABLE SYSTEM FOR OBJECT DETECTION WILL BE DEVELOPED USING THE BEST MODEL OR MODELS INVESTIGATED IN PHASE I.

HORIZONS TECHNOLOGY INC
3990 RUFFIN RD
SAN DIEGO, CA 92123
Program Manager: JOHN KOPECKY
Contract #:
Title: MISSION PLANNING WORKSTATION

Topic #: A90-169 Office: ETL ID #: 39612

THE IMPORTANCE OF TERRAIN DATA TO THE SUCCESS OF TACTICAL OPERATIONS AND ADVANCES IN COMPUTER TECHNOLOGY HAVE CREATED WIDESPREAD REQUIREMENTS FOR THE UTILIZATION OF DIGITAL TERRAIN DATA (DTD) WITHIN THE ARMY. THE CONCEPTS AND ANALYSIS DIVISION OF THE U.S. ARMY ENGINEER TOPOGRAPHIC LABORATORIES (USAETL) HAS THE PRIMARY RESPONSIBILITY FOR MANAGING THESE ARMY REQUIREMENTS AND IS INVESTIGATING THESE TECHNOLOGIES WITH THE EXPECTATION OF STANDARDIZING DTD IMPLEMENTATION IN ARMY TACTICAL SYSTEMS. HORIZONS TECHNOLOGY, INC. (HTI) PROPOSES TO SUPPORT USAETL IN STANDARDIZING THE USE OF DTD THROUGH THE DEVELOPMENT OF A PROTOTYPE DEMONSTRATION TERRAIN BASED MISION PLANNING WORKSTATION. EMERGING TECHNOLOGIES WILL BE ASSESSED DURING THE PHASE I EFFORT FOR INCORPORATION INTO THE TESTBED, INCLUDING ELECTRONIC MAP DISPLAY (EMD), GEOGRAPHIC INFORMATION SYSTEMS (GIS), COMPUTER IMAGE GENERATION (CIG), ARTIFICIAL INTELLIGENCE (AI), AND THE GLOBAL POSITIONING SYSTEM (GPS). EVALUATIONS OF TECHNOLOGY ASSESSMENTS AND OPERATIONAL AND COMBAT REQUIREMENTS WILL CULMINATE IN THE DEFINITION OF FUNCTIONAL REQUIREMENTS FOR THE TESTBED AND A SYSTEM FEASIBILITY DEMONSTRATION. MANY ARMY REQUIREMENTS FOR EMD HAVE BEEN SATISIFIED IN MISSION PLANNING SYSTEMS PREVIOUSLY DEVELOPED BY HTI. THE EFFORT IS A DIRECT EXTENSION OF SUCCESSFUL HTI RESEARCH AND DEVELOPMENT AND WILL BENEFIT FROM HTI'S REIDENT EXPERTISE IN THESE TECHNOLOGIES AND ONGOING INTERNAL RESEARCH PROGRAMS.

FLIGHT TECHNOLOGY INTERNATIONAL INC
ROUTE 4 - BOX 324
CHARLOTTESVILLE, VA 22901
Program Manager: M VAN WILSON
Contract #:
Title: IDENTIFICATION AND EVALUATION OF NATURAL FIBERS FOR CAMOUFLAGE NETTING MATERIAL
Topic #: A90-170 Office: WES ID #: 39614

THE INTENT OF THIS INVESTIGATION IS TO IDENTIFY FIBERS MADE FROM NON-STRATEGIC RAW MATERIALS, PREFERABLY WOOD FIBERS, THAT EXHIBIT OR CAN BE TREATED TO EXHIBIT THE NECESSARY CHARATERISTICS TO ALLOW THEM TO BE USED AS AN ALTERNATIVE TO PETRO-CHEMICAL BASED FIBERS FOR CAMOUFLAGE NETTING MANUFACTURE. THE SOLICITATION CONTAINS SPECIFIC REQUIREMENTS FOR ENVIRONMENTAL SURVIVABILITY, VISUAL, NIR, THERMAL IR, AND RADAR SIGNATURE CHARACTERISTICS, AND THIS PROPOSAL ENUMERATES THE METHODS BY WHICH FTI PLANS TO ACCOMPLISH THE IDENTIFICATION AND EVALUATION OF PURE AND COMPOSITE FIBERS AND TREATMENTS WITH THESE SPECIFICATIONS AS A GOAL.

ORCON CORP
1570 ATLANTIC STREET
UNION CITY, CA 94587
Program Manager: GERALD BEHLING
Contract #:
Title: LIGHT WEIGHT FLEXIBLE COMPOSITE CAMOUFLAGE MATERIAL
Topic #: A90-170 Office: WES ID #: 39613

CAMOUFLAGE SCREENS AND NETS ARE CURRENTLY BEING MADE OF COATED FABRICS AND FOILS. THE REQUIREMENTS OF THESE MATERIALS ARE SIGNATURE ALTERATION OF VISUAL, INFRARED, AND RADAR AS WELL AS BEING LOW COST, LIGHT WEIGHT, HIGH TENSILE, AND WEATHER RESISTANT. A COMPOSITE MATERIAL OF FILM OR NONWOVEN LENDS ITSELF THIS APPLICATION AT A LOWER WEIGHT AND HIGHER STRENGTH THAN COATED FABRICS OF FOILS. A STUDY WILL BE PERFORMED OF THE CURRENT MATERIALS AND TECHNOLOGIES AVAILABLE FOR CAMOUFLAGE MATERIALS. AN ANALYSIS OF MATERIALS APPROPRIATE FOR A LIGHT WEIGHT COMPOSITE WILL BE CHOSEN FOR PROTOTYPES SAMPLES. THE DATA FROM THE LITERATURE AND PRODUCT TESTING WILL BE EVALUATED AND SEVERAL MATERIALS WILL BE

RECOMMENDED FOR CAMOUFLAGE SCREENS AND NETS BASED ON WEIGHT, COST, PHYSICAL PROPERTIES, AND SIGNATURE ALTERATION OF VISUAL THROUGH MICROWAVE.

CHARLES RIVER ANALYTICS INC
55 WHEELER ST
CAMBRIDGE, MA 02138
Program Manager: DR GREG L ZACHARIAS
Contract #:
Title: OPTIMAL AIRCREW TASK ALLOCATION METHOD
Topic #: A90-171 Office: ARI ID #: 39615

THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT IS TO EVALUATE THE FEASIBILITY OF A METHOD FOR OPTIMALLY ALLOCATING TASKS ACROSS CREWMEMBERS, USING A MODEL-BASED APPROACH FOR OBJECTIVE EVALUATION EARLY IN THE DESIGN STAGE. THE APPROACH WILL CENTER ON THE SPECIFICATION AND USE OF AN INTEGRATED CREW/SYSTEM MODEL, AND ACCOUNT FOR THE CREW'S PERCEPTUAL PROCESSING, SITUATION ASSESSMENT, DECISION- MAKING, AND TASK EXECUTION FUNCTIONS. THE MODEL WILL BE USED TO GENERATE PERFORMANCE AND WORKLOAD MEASURES AS A FUNCTION OF CREW- MEMBER TASK ALLOCATION, AND WILL BE EMBEDDED IN A FORMAL PROCEDURE OF INITIAL TASK ALLOCATION, MODEL SIMULATION, AND ITERATIVE ADJUST- MENT OF THE ALLOCATION TO OPTIMIZE THE MODEL-BASED PERFORMANCE/ WORKLOAD MEASURES. WE PROPOSE TO EVALUATE FEASIBILITY VIA THREE TASKS. WE WILL: 1) DEVELOP THE MODEL-BASED TASK ALLOCATION METHOD; 2) DEMONSTRATE ITS USE IN A SELECTED DESIGN EFFORT; AND 3) IDENTIFY REQUIREMENTS FOR SIMULATOR VALIDATION AND TOOL DEVELOPMENT. A FINAL REPORT WILL SUMMARIZE THE STUDY'S OBJECTIVES, FINDINGS, AND RECOMMENDATIONS FOR FURTHER WORK.

MANAGEMENT RESEARCH INSTITUTE INC
8201 WOODHAVEN BLVD
BETHESDA, MD 20817
Program Manager: DR FRANK D HARDING
Contract #:
Title: COGNITIVE AND TEMPERAMENT PREDICTORS TO EXECUTIVE ABILITY: PRINCIPLES FOR DEVELOPING LEADERSHIP CAPACITY
Topic #: A90-172 Office: ARI ID #: 39616

PRIOR RESEARCH SUGGESTS THAT EFFECTIVE APPLICATION OF AVAILABLE COGNITIVE CAPACITIES REPRESENTS A CRUCIAL DETERMINANT OF HIGH-LEVEL ORGANIZATIONAL LEADERSHIP. THE EFFORT PROPOSED HEREIN IS INTENDED TO PROVIDE THE INFRASTRUCTURE REQUIRED FOR PROGRAMMATIC INTERVENTIONS CONCERNED WITH DEVELOPING THESE CAPACITIES SO AS TO ENHANCE MANAGERIAL PERFORMANCE AND ORGANIZATIONAL EFFECTIVENESS. THE FIRST PHASE WILL BEGIN WITH A SYSTEMATIC REVIEW OF THE LITERATURE BEARING ON THE NATURE OF COGNITIVE DEVELOPMENT IN ADULTHOOD. THE EXTANT LITERATURE, PRIOR RESEARCH, AND AVAILABLE THEORY WILL THEN BE USED TO SPECIFY THE COGNITIVE SKILLS CONTRIBUTING TO LEADERSHIP PERFORMANCE AS WELL AS ANY TEMPERAMENT CONSTRUCTS FACTORS AND TRAINING INTERVENTIONS CONDITIONING THE DEVELOPMENT OF AND SUCCESSFUL APPLICATION OF THESE COGNITIVE SKILLS IN LEADERSHIP SETTINGS. SUBSEQUENTLY, AVAILABLE MEASURES OF THESE ATTRIBUTES WILL BE IDENTIFIED, AND IF APPROPRIATE MEASURES OF THESE ATTRIBUTES ARE NOT AVAILABLE, NEW MEASURES WILL BE CONSTRUCTED. IN THE SECOND PHASE OF THIS INVESTIGATION, THESE MEASURES WILL PROVIDE A BASIS FOR ESTABLISHING THE CAUSAL IMPACT OF THESE COGNITIVE SKILLS AND TEMPERAMENTAL FACTORS ON LEADERSHIP PERFORMANCE.

INTERSYSTEMS INC
820 WEST END AVE - 15E

NEW YORK, NY 10025
Program Manager: MARY ANN FORGEY
Contract #:
Title: SOCIAL CLIMATE INDICATORS FOR THE U.S. ARMY
Topic #: A90-175 Office: ARI ID #: 39617

THIS STUDY WILL FILL GAPS IN ARMY RESEARCH ON MEASURES AND NORMS OF MORALE, SOCIAL CLIMATE, AND JOB SATISFACTION INDICATORS. ULTIMATELY, THE RESEARCH WILL YIELD A HANDBOOK OF INSTRUMENTS FOR MEASURING THESE INDICATORS AMONG U.S. ARMY PERSONNEL AND UNITS. THAT HANDBOOK WILL DETAIL THE PSYCHOMETRIC PROPERTIES OF THE MEASURES AND WILL GIVE NORMATIVE DATA FROM EACH INSTRUMENT AMONG U.S. ARMY PERSONNEL. THE STUDY WILL ACCOMPLISH THREE TECHNICAL OBJECTIVES RELATED TO THE MEASUREMENT OF AND NORMS FOR SOCIAL CLIMATE INDICATORS. THESE TECHNICAL OBJECTIVES ARE FIRST, TO IDENTIFY AND COMPILE MEASUREMENT INSTRUMENTS OF SOCIAL CLIMATE INDICATORS TO INCLUDE PSYCHOMETRIC PROPERTIES, AVAILABLE NORMATIVE DATA, AND MEASURES SPECIFICALLY DEVELOPED FOR USE IN U.S. ARMY APPLICATIONS. SECOND, THE STUDY WILL DEFINE AND OPERATIONALIZE SOCIAL CLIMATE CONSTRUCTS FOR WHICH NO MEASURES EXIST AND FOR WHICH MEASURES RELATED TO ARMY APPLICATIONS ARE NEEDED. AND, THIRD, THE STUDY WILL DESCRIBE A RESEARCH PLAN FOR THE DEVELOPMENT OF SCALES RESPONSIVE TO CONSTRUCTS IDENTIFIED EARLIER, INCLUDING PSYCHOMETRIC TESTING PROCEDURES AND THE COLLECTION OF ARMY NORMATIVE DATA.

KLEIN ASSOCS INC
PO BOX 264 - 800 LIVERMORE ST
YELLOW SPRINGS, OH 45387
Program Manager: DR GARY A KLEIN
Contract #:
Title: INTEGRATED PERFORMANCE MEASUREMENT OF TACTICAL UNITS
Topic #: A90-176 Office: ARI ID #: 39618

THE EXISTING TECHNIQUES FOR EVALUATING GOOD AND POOR ARMY UNIT PERFORMNCE GENERATE LIMITED AND POTENTIALLY DISTORTED IMPRESSIONS. YET PERFORMANCE MEASUREMENT IS NECESSARY IN ORDER TO ASSESS THE VALUE OF NEW WEAPONS SYSTEMS, TACTICS, AND ORGANIZATIONAL STRUCTURES. THERE IS A NEED FOR A GLOBAL, THEORY-BASED, AND INTEGRATED APPROACH THAT CAN PRESENT AN OVERALL PERSPECTIVE WHILE ALSO PROVIDING THE NECESSARY LEVEL OF DETAIL. THIS PROPOSAL FOCUSES ON TEAM DECISION PERFORMANCE. KLEIN ASSOCIATES HAS DEVELOPED MODELS OF INDIVIDUAL AND TEAM DECISION MAKING. RECENTLY WE HAVE DERIVED A GLOBAL MODEL OF TEAM FUNCTIONING, INTEGRATING BEHAVIORAL, COMMUNICATION, AND INDIVIDUAL FACETS OF TEAM PERFORMANCE. EACH OF THESE FACETS IS ANCHORED IN A SPECIFIC SET OF PROCEDURES FOR COLLECTING DATA. WE PROPOSE TO APPLY THESE MODELS TO THE TASK OF DEVELOPING PERFORMANCE MEASURES FOR TACTICAL UNITS. PHASE 1 WILL SYNTHESIZE AND EXPAND THE EXISTING MODELS, TO OBTAIN A THEORY SPECIFICALLY ADDRESSING ARMY TACTICAL UNITS. WE WILL USE THIS MODEL TO GENERATE A SET OF PERFORMANCE MEASUREMENT TECHNIQUES, AND WILL TEST THESE TECHNIQUES USING THE DATABASE AT THE NATIONAL TRAINING CENTER.

ENZYME TECHNOLOGY RESEARCH GP INC
710 W MAIN ST
DURHAM, NC 27701
Program Manager: DR JOHN P O'DALY
Contract #:
Title: ELECTROCHEMICAL ENZYME IMMUNOASSY FOR DETECTION OF TOXINS
Topic #: A90-180 Office: MEDICAL ID #: 39621

THERE IS A NEED FOR SENSORS THAT PROVIDE DIRECT, REAL-TIME MEASUREMENT OF TOXINS TO SOLVE

MAJOR PROBLEMS IN ENVIRONMENTAL MONITORING AND SAFETY. WE PROPOSE TO EVALUATE AND DEVELOP A NEW BIOSENSOR DESIGN THAT COMBINES ADVANTAGES OF IMMUNOASSAY WITH ELECTROCHEMICAL RESPONSE. THE SPECIFIC OBJECTIVE OF THE PHASE I WORK IS TO PROVE THE PRINCIPLE OF ELECTROCHEMICAL ENZYME IMMUNO- SENSORS TO DETECT SMALL MOLECULES IN BIOLOGICAL SAMPLES. THE PROPOSED BIOSENSOR CONSISTS OF THREE MAJOR ELEMENTS: AN ELECTRICAL CONDUCTING LAYER HAVING IMMOBILIZED ENZYME; A GEL LAYER CONTAINING POLYCLONAL OR MONOCLONAL ANTIBODY AND OTHER NECESSARY REAGENTS; AND THE ELECTRONIC COMPONENTS USED IN THE READOUT OF THE SIGNAL. THE EXPECTED RESULTS OF THIS WORK ARE AN AMPEROMETRIC ENZYME IMMUNO- ELECTRODE FOR IMMUNOASSAYS OF SMALL CHEMICAL MOLECULES, BASED ON THE PRINCIPLE OF COUPLING THE IMMUNOCHEMICAL REACTION TO THE ELECTRODE RESPONSE BY USING A SOLUBLE ELECTROCHEMICALLY ACTIVE MEDIATOR. THE THREE RESEARCHERS SUBMITTING THIS PROPOSAL HAVE COLLABORATED SUCCESSFULLY TO DEVELOP PROTOTYPE ENZYME-BASED BIOSENSOR TECHNOLOGY WHICH WILL BE A CRUCIAL COMPONENT FOR THE RESEARCH AND DEVELOPMENT DESCRIBED IN THIS PROPOSAL. PRACTICAL ELECTROCHEMICAL SENSORS THAT EMPLOY IMMUNOCHEMICAL DETECTION WILL HAVE BROAD COMMERCIAL VIABILITY FOR APPLICATIONS IN THE FIELDS OF CLINICAL CHEMISTRY, VETERINARY MEDICINE, AGRICULTURE, AND ENVIRONMENTAL MONITORING.

TECHNICAL RESEARCH ASSOCS INC
410 CHIPETA WY
SALT LAKE CITY, UT 84108
Program Manager: DR CLIFTON G SANDERS
Contract #:
Title: ULTRASOUND ASSISTED ASSAY FOR TOXINS IN BLOOD
Topic #: A90-180 Office: MEDICAL ID #: 39619

THE LONG-TERM OBJECTIVE OF THIS PROJECT IS TO SUCCESSFULLY COMBINE ULTRASOUND TECHNOLOGY DEVELOPED AT TRA WITH ASSAY METHODS AND PECTROSCOPIC ANALYTICAL TECHNIQUES FOR DETECTING SPECIFIC TOXINS IN WHOLE BLOOD SAMPLES. THE RESEARCH IN PHASE I OF THIS PROPOSAL FOCUSES ON THE APPLICATION OF THIS METHODOLOGY TO THE ANALYSIS OF SAXITOXIN. THE KNOWN CHEMICAL ASSAY METHOD WILL BE MODIFIED FOR COATING IN HEMATOCRIT TUBES, AND THE COMPOSITION OF THE FORMULATION WILL BE OPTIMIZED FOR RAPID FLUORESCENT DETECTION OF SAXITOXIN DEGRADATION PRODUCT IN PLASMA. TUBES COATED WITH THE OPTIMUM FORMULATION WILL THEN BE USED TO SAMPLE WHOLE BLOOD WHICH WILL SOLUBILIZE THE ASSAY FORMULATION. ULTRASOUND WILL BE USED TO BAND WHOLE BLOOD INTO PACKED CELL AND PLASMA REGIONS, AND THE SAXITOXIN LEVELS WILL BE DETERMINED BY FLUORESCENT ANALYSIS OF THE PLASMA REGIONS. SUCCESSFUL COMPLETION OF THE PHASE I RESEARCH WILL DEMONSTRATE A STRAIGHTFORWARD METHOD FOR BLOOD ANALYSIS THAT CAN BE ADAPTED FOR DETECTION OF A WIDE VARIETY OF TOXINS (PHASE II). THIS METHODOLOGY WOULD THEN BE SUITABLE FOR FIELD USE INASMUCH AS IT REQUIRES SMALL AMOUNTS OF BLOOD, INEXPENSIVE AND DISPOSAL EQUIPMENT, AND MINIMALLY TRAINED PERSONNEL.

UNIVAX CORP
12111 PARKLAWN DR
ROCKVILLE, MD 20852
Program Manager: DR D CRAIG WRIGHT
Contract #:
Title: THE DEVELOPMENT OF HUMAN ANTIBODIES AGAINST RICIN BY INVITOR STIMULATION
Topic #: A90-180 Office: MEDICAL ID #: 39620

THIS SBIR PROPOSAL DESCRIBES THE DEVELOPMENT OF AN APPROACH TO IMMUNOPROPHYLAXIS AGAINST RICIN TOXIN. WE PLAN TO PRODUCE A RICIN TOXOID VACCINE FOR THE DEVELOPMENT OF HUMAN MONOCLONAL ANTIBODIES AGAINST RICIN TOXIN. IN PHASE I, WE PROPOSE TO PRODUCE AND CHARACTERIE A CANDIDATE RICIN TOXOID VACCINE AND USE THIS VACCINE FOR INVITRO SIMULATION

OF HUMAN LYMPHOCYTES THE SECRETE ANTIBODIES AGAINST RICIN TOXIN. IN PHASE II, HUMAN HYBRIDOMAS SECRETING MONOCLONAL ANTIBODIES AGAINST RICIN TOXIN WOULD BE PRODUCED BY FUSING EBV-TRANSFORMED LYMPHOCYTES TO THE HETEROMYELOMA FUSION PARTNER SHM-D33. NEUTRALIZING MONOCLONAL ANTIBODIES ARE EXPECTED TO BE USEFUL FOR BOTH THE PROPHYLAXIS AND THERAPY OF RICIN POISONING.

ADEZA BIOMEDICAL
1240 ELKO DR
SUNNYVALE, CA 94089
Program Manager: DR DAVID E CHARLTON
Contract #:
Title: DIAGNOSIS OF NATURAL AND INDUCED DISEASES OF MILITARY IMPORTANCE
Topic #: A90-181 Office: MEDICAL ID #: 39623

WE PROPOSE TO DEVELOP A SIMPLE, PORTABLE, ONE-STEP ASSAY FOR THE DETECTION OF MYCOPLASMA PNEUMONIAE AND INFLUENZA A WHICH CAN BE PERFORMED INDEPENDENT OF A SOPHISTICATED LABORATORY BY UNTRAINED OR SEMI-SKILLED PERSONNEL. THIS SIMPLE, ONE-STEP METHOD IS CALLED AN OPTICAL BIOASSAY (OBA) AND UTILIZES AN INEXPENSIVE LASER AND PHOTODETECTOR TO DETECT AN ANTIGEN-ANTIBODY BINDING EVENT. ANTIBODY IS COVALENTLY ATTACHED TO A SILICON SURFACE AND TREATED WITH A PROPRIETARY PHOTOLITHOGRAPHIC TECHNIQUE TO PRODUCE ALTERNATING ROWS OF IMMUNOREACTIVE AND NON-IMMUNOREACTIVE ANTIBODY. WHEN A NARROW LASER LIGHT BEAM IS DIRECTED AT THE ANTIBODY COATED SILICON SURFACE, THE LIGHT IS REFLECTED AT ITS INCIDENT ANGLE WITHOUT DIFFRACTION. WHEN ANTIGEN BINDS TO THE IMMUNOREACTIVE (BUT NOT TO THE NON-IMMUNOREACTIVE ANTIBODY) A BIOLOGICAL GRID IS CREATED. WHEN LIGHT IS DIRECTED AT THE REACTED SURFACE, THE BIOLOGICAL GRID PRODUCES A DIFFRACTION SIGNAL WHICH IS EASILY DETECTED WITH THE INTENSITY OF THE DIFFRACTION BEING PROPORTIONAL TO THE NUMBER OF SPECIFIC ANTIGEN-ANTIBODY EVENTS ON THE CHIP. FINALLY, THE SOPHISTICATED BUT SIMPLE SYNTHESIS OF MICROELECTRONICS AND BIOTECHNOLOGY MAKES THIS IMMUNODIAGNOSTIC SYSTEM EXTREMELY PORTABLE AND SUITABLE FOR USE IN NON-LABORATORY SETTINGS SUCH AS PHYSICIAN'S OFFICE OR FIELD TESTING.

BIO-METRIC SYSTEMS INC
9924 W SEVENTY FOURTH ST
EDEN PRAIRIE, MN 55344
Program Manager: SHERYL L GREGG
Contract #:
Title: TRI-ELISA FOR SIMULTANEOUS ANALYSIS OF THREE ANALYTES
Topic #: A90-181 Office: MEDICAL ID #: 39624

THE ENZYME-LINKED IMMUNOSORBENT ASSARY (ELISA) IS A MAJOR TOOL FOR DETECTING INFECTIOUS AGENTS, PROTEINS, AND DRUGS IN BIOLOGICAL FLUIDS, OR CONTAMINANTS IN ENVIRONMENTAL SAMPLES. THE MAJORITY OF ELISA'S ARE DESIGNED TO DETECT A SINGLE ANALYTE. WE PROPOSE HERE TO DEVELOP A THREE-ENZYME ELISA SYSTEM IN WHICH THREE ANALYTES CAN BE QUANTITATED CONCURRENTLY FROM A SINGLE SAMPLE. WE HAVE IDENTIFIED THREE ENSYMES/SUBSTRATES THAT HAVE MINIMAL OVERLAP AT THREE SEPARATE WAVELENGTHS CORRESPONDING TO THEIR RESPECTIVE MAXIMUM ABSORBANCE. DURING PHASE I, WE WILL DEFINITIVELY IDENTIFY THE THREE ENZYMES AND MULTIPLE SUBSTRATE SOLUTIONS THAT WILL WORK SIMULTANEOUSLY, CONJUGATE EACH ENZYME TO A SEPARATE ANTIBODY, DEVELOP INDIVIDUAL ELISA'S FOR EACH ANALYTE, AND TEST THE THREE ANALYTE SYSTEMS CON- CURRENTLY. THE ELISA'S WILL BE DEVELOPED USING A FUNGUS (CANDIDA ALBICANS), A VIRUS (HERPES SIMPLEX VIRUS, TYPE 1), AND A BACTERIA (PSEUDOMONAS AERUGINOSA). THE EXPECTED RESULTS OF THIS PHASE I PROJECT WILL DEMONSTRATE FEASIBILITY AND PROVIDE THE BASIS FOR CONTINUATION INTO A PHASE II PROJECT.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR GAJENDRA SAVANT
Contract #:
Title: DIAGNOSIS OF NATURAL AND INDUCED DISEASES OF MILITARY IMPORTANCE
Topic #: A90-181 Office: MEDICAL ID #: 39622

PHYSICAL OPTICS CORPORATION (POC) IS PROPOSING A COMPLETELY NEW HIV TEST WHICH IS BASED ON A HIGHLY SENSITIVE LIGAND RECEPTOR BINDING STUDY DEVELOPED AT POC. IN THIS PROGRAM, THE FEASIBILITY OF DESIGN- ING A POLARIZATION FLUORIMETER DEVICE FOR AIDS VIRUS DETECTION WILL BE INVESTIGATED, AS WILL A METHOD OF MEASURMENT USING THE DEVICE. SUCH A DEVICE SHOULD BE CAPABLE OF IDENTIFYING THE AGENT WITH A HIGH ACCURACY AND WITH REPRODUCIBLE RESULTS. IT SHOULD ALSO BE INEXPENSIVE, SIMPLE AND PORTABLE FOR USE IN PHYSICIANS OFFICES, SMALL DIAGNOSTIC LABORATORIES AND HOSPITALS. MATTERS TO BE INTENSIVELY STUDIED WITHIN THE TIME FRAME OF PHASE I INCLUDE DEVICE DESIGN, OPTO-ELECTRONIC ELEMENT REQUIREMENTS, REPRODUCIBILITY AND THE ACCURACY OF THE MEASURMENTS. FLUORESCENT ANALYSIS OF A PEPID-ANTIBODY REACTION IS VERY SENSITIVE AND FAST AND THE POLARIZATION METHOD PROVIDES A QUALITATIVE RESULT. BASED ON POC'S HOLOGRAPHIC FILTERS, POLARIZERS AND PLANAR WAVE GUIDES FABRICATED IN POC'S LABORATORY, VERY COMPACT CONSTRUCTION OF SUCH A DEVICE IS POSSIBLE. ALSO, DUE TO THE LOW COST OF HOLOGRAPHIC OPTICAL ELEMENTS AND LIGHT SOURCES, THE GOAL OF COST EFFECTIVENESS WILL BE ACHIEVED. THE NUMERICAL RESULTS YIELDED BY THIS TEST WILL MAKE THE DEVICE AND METHOD SIMPLE TO USE, EVEN FOR INEXPERIENCED PERSONNEL.

HAWAII BIOTECHNOLOGY GP INC
99-193 AIEA HEIGHTS DR
AIEA, HI 96701
Program Manager: DR JOHN M IVY
Contract #:
Title: EXPRESSION OF DENGUE 3 ENVELOPE AND NONSTRUCTURAL 1 GLYCOPROTEINS IN THE FUNGUS NEUROSPORA CRASSA
Topic #: A90-184 Office: MEDICAL ID #: 39625

THE FOUR SEROTYPES OF DENGUE VIRUSES ARE A LEADING CAUSE OF MORBIDITY THROUGHOUT THE TROPICS AND SUBTROPICS. FOR THE DEVELOPMENT OF DIAGNOSTICS FOR AND SUBUNIT VACCINES AGAINST DENGUE VIRUS, A RELIABLE AND INEXPENSIVE SOURCE OF DENGUE PROTEINS IS NEEDED. THE EXPRESSION OF RECOMBINANT PROTEINS IN MICROORGANISMS OFFER SIGNAITICANT ADVANTAGES TO PURIFICATION OF NATIVE VIRAL PROTEINS. WE PROPOSE TO EVALUATE THE USE OF THE FUNGUS NEUROSPORA CRASSA TO PRODUCE AUTHENTIC DENGUE 3 ENVELOPE AND NONSTRUCTURAL 1 GLYCOPROTEINS. THE SEQUENCES ENCODING THESE PROTEINS WILL BE PLACED UNDER THE TRANSCRIPTIONAL CONTROL OF A CONSTITUTUVE NEUROSPORA PROMOTER, EITHER WITH THEIR OWN SECRETION SIGNAL PEPTIDES OR WITH A HETEROLOGOUS SIGNAL PEPTIDE. THE PROTEIN PRODUCED WILL BE EVALUATED WITH RESPECT TO MOLECULAR WEIGHT, GLYCOSYLATION AND ANTIGENICITY.

ECOTECH
10241 SHELDON RD
ELK GROVE, CA 95624
Program Manager: DONALD C McGEHEE
Contract #:
Title: SMALL ION EXCHANGE WATER PURIFIER
Topic #: A90-186 Office: MEDICAL ID #: 39626

RESEARCH WILL BE CONDUCTED INTO THE FEASIBILITY OF MAKING A 12 OZ. SIZE DEVICE THAT DEMINERALIZES POTABLE WATER BY AN ION EXCHANGE PROCESS WITH A DEIONIZATION CAPABILITY OF

AT LEAST 1 GRAM EQUIVLENT OF NaCl. THE PRODUCT WATER WILL BE OF ONE MEGOHM SPECIFIC RESISTANCE OR BETTER REGARDLESS OF WHETHER THE DEVICE IS OPERATED VERTICALLY OR HORIZONTALLY. WE PROPOSE TO OVERCOME THE PROBLEM OF PRODUCT WATER QUALITY DEGRADATION DUE TO CHANNELING WHEN AN ION EXCHANGE COLUMN IS NOT OPERATED IN THE VERTICAL BY EMBEDDING A MIXTURE OF STRONG ACID AND STRONG BASE RESINS IN A HYDROPHILIC OPEN CELL FOAM. THE FOAM WILL PROVIDE A UNIFORM WATER FLOW THROUGH THE ION EXCHANGE BEADS VIA THE OPEN-CELLED CHANNELS. THE OPEN CELL FOAM WILL BE MADE OF SEVERAL RESING TYPES COMMONLY USED IN THE INDUSTRY AND DEEMED SUITABLE FOR THIS APPLICATION. AT LEAST ONE ALTERNATIVE METHOD TO THE FOAM TECHNIQUE WILL BE EVALUATED. STRONG ACID/STRONG BASE ION EXCHANGE RESINS WILL BE UTILIZED BECAUSE THEY ARE KNOWN TO PRODUCE THE DESIRED WATER QUALITY.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: DR HARRIS GOLD
Contract #:
Title: SPIRAL WOUND ION EXCHANGE UNIT FOR THE PRODUCTION OF STERILE WATER FOR INJECTION
Topic #: A90-186 Office: MEDICAL ID #: 39628

THE U.S. ARMY RESEARCH AND DEVELOPMENT COMMAND IS DEVELOPING A WATER TREATMENT SYSTEMM FOR THE PREPARATION OF U.S. PHARMACOPEIA (STERILE, PYROGEN-FREE) WATER FOR INJECTION FROM POTABLE WATER SOURCES IN A FIELD SETTING. ONE IMPORTANT COMPONENT OF THE SYSTEM IS AN ION EXCHANGE UNIT TO POLISH WATER TREATED BY REVERSE OSMOSIS. CONVEN- TIONAL ION EXCHANGE UNITS HAVE GEOMETRIC CONSTRAINTS THAT DO NOT MAKE THEM SUITABLE FOR FIELD USE. THIS PHASE I PROGRAM ADDRESSES THE DEVELOPMENT AND TETING OF A PROTOTYPE SYSTEM THAT WILL BE NO LONGER THAN A 12-OZ. BEVERAGE CAN, HAS AN EXCHANGE CAPACITY OF AT LEAST 1G AS SODIUM CHLORIDE, AND MUST PRODUCE WATER WITH A SPECIFIC RESISTANCE OF AT LEAST 1Mohm. THE UNIT MUST ALSO BE ABLE TO OPERATE IN ANY POSITION WITHOUT LOSS OF EXCHANGE CAPACITY DUE TO CHANNELING. THE DESIGN INVOLVES THE USE OF A SPIRAL GEOMETRY IN CONJUNCTION WITH A RELATIVELY NARROW DIAMETER BED TO OBTAIN A LONG BED LENGTH AND A HIGH CAPACITY WITHIN THE BEVERAGE CAN ENVELOPE. THE DESIGN ALSO INVOLVES THE USE OF A COMPRESSIVE FORCE TO DISTORT THE BED, TAKING UP THE EXCESS VOLUME AS THE RESIN CONTRACTS DURING SERVICE AND PREVENTING CHANNELING ALONG THE WALLS.

SEPRATECH
2131 LAS PALMAS DR - STE A
CARLSBAD, CA 92008
Program Manager: DR MICHAEL A TAYLOR
Contract #:
Title: MIXED-BED ION EXCHANGE DEVICE FOR WATER PURIFICATION
Topic #: A90-186 Office: MEDICAL ID #: 39627

THE PRIMARY OBJECTIVE OF THIS PROPOSAL IS TO DETERMINE THE FEASIBILITY OF MANUFACTURING A POTABLE WATER PURIFICATION DEVICE CONTAINING MIXED-BED, ION EXCHANGE, SEPARATORY MATRIX. THE PROPOSED DEVICE WOULD BE CAPABLE OF PRODUCING WATER TO 1 MEGAOHM CONDUCTIVITY WITH A MINIMAL CAPACITY OF 1 GRAM OF SODIUM CHLORIDE IN A FIELD SETTING. THIS DEVICE WILL ALSO BE CAPABLE OF OPERATING IN ANY ORIENTATION WITHOUT THE GENERATION OF INTERNAL CHANNELS, WHILE MAINTAINING A UNIFORMITY OF FLUID FLOW THROUGH THE SEPARATORY MATRIX. THESE OBJECTIVES WILL BE ACHIEVED THROUGH INCORPORATION OF STATE-OF- THE-ART, PROPRIETARY DESIGNS INTO THE PROPOSED DEVICE. SEPRATECH HAS RECENTLY RECEIVED A U.S. PATENT FOR A DESIGN FULFILLING SUBSTANTIALLY THE SAME REQUIREMENTS AS DESCRIBED IN SBIR SOLICITATION A90-186 AND REFERENCED IN TECHNICAL REPORT 8814 (AD-A207 411). THE INTERNAL STRUCTURE OF ANALOGOUS ION EXCHANGE DEVICES, CURRENTLY MANUFACTURED BY SEPRATECH, ELIMINATE THE PROBLEM ASSOCIATED

WITH SEPARATORY MATRIX WELLING AND CONTRACTION, I.E. MATRIX COMPACTION AND CHANNEL FORMATION. THESE DEVICES ARE EQUALLY FUNCTIONAL IN ANY ORIENTATION. THE DESIGN ALSO ENABLES ENHANCED SEPARATORY POTENTIAL ABOVE THAT OF TRADITIONAL SEPARATORY COLUMNS WHILE REDUCING THE TIME REQUIRED FOR SEPARATION. THE DEVICES ARE MANUFACTURED FOR CLINICAL USE, THEREFORE, ARE MANUFACTURED ASEPTICALLY AND ARE EASILY STERILIZED BY SEVERAL METHODS.

PRINCETON SCIENTIFIC ENTERPRISES INC
1108 KINGSTON RD
PRINCETON, NJ 08540
Program Manager: DAVID W BLAIR
Contract #:
Title: INSTRUMENT TO MEASURE THE OXYGEN EQUILIBRIUM CURVE
Topic #: A90-187 Office: MEDICAL ID #: 39629

THIS IS A PROPOSAL TO DESIGN, MANUFACTURE AND DELIVER A NEW FULLY AUTOMATED INSTRUMENT TO MEASURE, RECORD AND ANALYZE THE OXYGEN EQUILIBRIUM CURVE OF BLOOD AND/OR HEMOGLOBIN SOLUTIONS. IT WILL BE A WORKING VERSION OF AN INSTRUMENT EXISTING IN THE CONTRACTING ARMY LABORATORY. IT WILL BE FULLY COMPUTER CONTROLLED BY AN 80386 OR 68020 BASED PERSONAL COMPUTER EQUIPPED WITH I/O BOARDS FOR DATA ACQUISITION AND CONTROL AND A STEPPER MOTOR INDEXER BOARD FOR CONTROL OF REAGENT PUMPING RATES. IT WILL IMPLEMENT EXISTING METHODS OF GENERATING THE CURVE IN A SINGLE INSTRUMENT PACKAGE THAT INCLUDES EXPERIMENTAL CONTROL, DATA ACQUISITION, DATA REDUCTION, REPORTING AND DISPLAY. THE DESIGN WILL BE MADE AND EXECUTED IN CLOSE CONSULTATION WITH ARMY REPRESENTATIVES TO ASSURE THAT THE FINISHED INSTRUMENT OPTIMALLY FULFILLS THEIR NEEDS. IT WILL BE THE PROTOTYPE FOR SUBSEQUENT MODELS THAT CAN BE MASS PRODUCED BY A COMMERCIAL VENDOR. THIS PROGRAM WILL RESULT IN THE TIMELY PRODUCTION AND DELIVERY TO THE ARMY OF A PROTOTYPE INSTRUMENT THAT OPTIMALLY MEETS THEIR REQUIREMENTS AND WHICH IS QUITE ECONOMICAL.

GUMBS ASSOCS INC
11 HARTS LN
EAST BRUNSWICK, NJ 08816
Program Manager: DR RONALD W GUMBS
Contract #:
Title: BIOCOMPATIBLE ADHESIVES
Topic #: A90-188 Office: MEDICAL ID #: 39630

THIS PROPOSAL OUTLINES A RESEARCH AND DEVELOPMENT PROGRAM TO TAILOR- MAKE EMULSION ACRYLIC COPOLYMERS WHICH ARE ODORLESS, NON-TOXIC, AND PRESSURE SENSITIVE. THE WATER-INSOLUBLE, BIOCOMPATIBLE ADHESIVES WILL CONTAIN THE MINIMUM CONCENTRATION OF HYDROPHILIC UNITS TO PERMIT STRONG BONDING TO WET HUMAN SKIN AND STILL RETAIN THE REQUIRED DEGREE OF WATER RESISTANCE. OPTIMUM RHEOLOGICAL PROPERTIES WILL BE ACHIEVED BY SELECTING THE SYSTEM THAT HAS A LOW MO''LUS OF ELASTICITY T LOW ELONGATION. THIS WILL BE INDICATED FROM MEASUREMENTS OF THE PEEL ADHESION AS A FUNCTION OF PEEL RATE. THE OVERALL GOAL OF THE PROGRAM IS A BIOLOGICALLY COMPATIBLE ADHESIVE THAT WILL SUCCESSFULLY MAINTAIN THE ADHERENCE OF A DERMAL DRESSING TO MOIST SKIN ON ACTIVE SOLDIERS WORKING IN HOT HUMID ENVIRONMENTS, WITHOUT PRODUCING ANY ADVERSE REACTIONS. PHASE II WILL INVOLVE A CLINICAL EVALUATION OF THE ADHESIVES, APPLIED TO A EMI-OCCLUSIVE MATERIAL. THE OBJECTIVE WILL BE TO DEMONSTRATE DURABILITY, EFFICACY, BIOCOMPATIBILITY AND THE ABSENCE OF ADVERSE SKIN REACTIONS.

POLYTRONIX INC

805 ALPHA DR
RICHARDSON, TX 75081
Program Manager: DR JACOB W LIN
Contract #:
Title: A PASSIVE BADGE DOSIMETER FOR HCL DETECTION AND MEASUREMENT
Topic #: A90-189 Office: MEDICAL ID #: 39631

THIS PROPOSAL INVOLVES THE USE OF ENCAPSULATED MICRODROPLETS TO BE EMPLOYED AS A PASSIVE DOSIMETER BADGE FOR HCl MEASUREMENTS. THE DROPLETS WILL CONTAIN pH SENSITIVE DYE MOLECULES DISSOLVED IN HOST LIQUID CRYSTAL MOLECULES. PERMEATION OF HCl MOLECULES THROUGH THE ULTRATHIN ENCASING POLYMERIC SKIN OF THE DROPLETS WILL RESULT IN A pH DRIVEN COLOR CHANGE. THIS COLOR CHANGE, AND HENCE TOTAL HCl EXPOSURE, WILL BE MONITORED SPECTROPHOTOMETRICALLY AFTER SPECIFIED ELASPED PERIODS OF TIME. THE HCl DOISMETER BADGE WILL BE LIGHTWEIGHT (LESS THAN 1 OZ.), AND THUS PORTABLE. THE TECHNIQUE PROPOSED IS IDEAL FOR MASS PRODUCTION AND WILL RESULT IN THE PRODUCTION OF A RELATIVELY INEXPENSIVE BADGE. THE TECHNOLOGY PROPOSED IS BASED ON RECENT ADVANCES IN MICROENCAPSULATION METHODS DEVELOPED IN OUR LABORATORIES. THESE ADVANCES INCLUDE THE ABILITY TO FINE CONTROL DROPLET SIZE AS WELL AS THE ABILITY TO ENCAPSULATE DYE MOLECULES AS GUEST MOLECULES IN A HOST LIQUID WITHIN THESE DROPLETS. THE FOCUS OF OUR PROPOSED RESEARCH WILL BE TO OPTIMIZE VARIABLES TO MAXIMIZE HCl DETECTION SENSITIVITY. THIS WILL INCLUDE IDENTIFICATION OF THE BEST pH INDICATOR DYE/HOST LIQUID CRYSTAL MIX, THE BEST POLYMERIC SKIN AND MINIMUM SKIN THICKNESS ATTAINABLE AND THE HCl SENSITIVITY OF THE DOSIMETER BADGE DEVELOPED. THE PHASE I EFFORT WILL TERMINATE WITH COMPLETION OF SAMPLE HCl DOSIMETER BADGES WHICH WILL BE SUBMITTED TO THE ARMY LABS AT FORT DETRICK FOR FURTHER TESTING.

NORTHEAST RESEARCH INSTITUTE INC
309 FARMINGTON AVE - STE A-100
FARMINGTON, CT 06032
Program Manager: IRVING N EINHORN
Contract #:
Title: A COMPUTERIZED BENCH-TOP INDUSTRIAL HYGIENE TEST CHAMBER
Topic #: A90-190 Office: MEDICAL ID #: 39632

CONFIRMING THE ACCURAY OF LIFE-PROTECTING INDUSTRIAL HYGIENE TEST EQUIPMENT OR SIMULATING MILITARY ENVIRONMENTS OFTEN REQUIRES SOPHISTICATED AND CUMBERSOME TEST CHAMBERS DEPENDENT ON COMPLICATED CALCULATIONS. THE CALIBRATION OF SUCH TEST EQUIPMENT MAY BE EASILY COMPROMISED BY OPERATOR ERROR WHERE INVOLVED CALCULATIONS ARE USED AND COMPLICATED INTERCONNECTIONS AND VALVES ARE EMPLOYED. WE PROPOSE TO USE A COMPUTERIZED GAS STANDARDS GENERATOR, AND A PARTICLE GENERATOR CUSTOMIZED TO FIT A SPECIALLY DESIGNED PLEXIGLASS CHAMBER THAT IS BENCH-TOP SIZED. THIS CHAMBER WILL BE DESIGNED FOR RUGGEDNESS AND MOBILITY TO PERMIT USE IN THE FIELD. THIS PROJECT WILL RESULT IN THE DELIVERY OF A COMPUTERIZED INDUSTRIAL HYGIENE TEST CHAMBER THAT ELIMINATES THE NEED FOR OPERATOR CALCULATIONS WHILE AUTOMATING THE BLENDING OF GASES AND AEROSOLS, AND PERMITTING THE SIMULATION OF CONTROLLED TEST ENVIRONMENTS. THERE EXISTS WITHIN THE NORTHEAST RESEARH, INC. AND THE SCHOOL OF PUBLIC HEALTH AT THE UNIVERSITY OF MASSACHUSETTS (DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES) CONSIDERABLE EXPERTISE AND FACILITIES IN ANALYTIC MONITORING, INDUSTRIAL HYGIENE MEASUREMENTS, AND COMPUTERIZED APPLICATIONS. THESE TWO INSTITUTIONS HAVE PARTICIPATED IN A NUMBER OF PREVIOUS RELATED RESEARCH EFFORTS INCLUDING SBIR GRANTS.

BIO-METRIC SYSTEMS INC
9924 W SEVENTY-FOURTH ST
EDEN PRAIRIE, MN 55344

Program Manager: DR MELVIN J SWANSON
Contract #:
Title: CONDUCTANCE BIOSENSOR FOR DETECTING MICROORGANISMS
Topic #: A90-191 Office: MEDICAL ID #: 39633

A PROJECT IS PROPOSED TO DEVELOP A BIOSENSOR FOR MEASURING PATHOGENIC MICROORGANISMS IN WATER BY MEASURING CHANGES IN CONDUCTANCE ACROSS MICROPOROUS, POLYCARBONATE MEMBRANE COATE WITH SPECIFIC ANTIBODIES. THE MEMBRANES WILL BE COATED WITH HYDROPHILIC POLYMERS USING PHOTOCHEMICAL COUPLING. ANTIBODIES SPECIFIC FOR THE ANALYTE WILL THEN BE COUPLED TO THE POLYMER-COATED MEMBRANES PRIMARILY IN THE PORES. THE COATING AND IMMOBILIZATION METHODS ARE DESIGNED TO MINIMIZE NONSPECIFIC ADSORPTION OF PROTEINS AND TO STABILIZE THE ANTIBODY. THE PURPOSE IS TO DEMONSTRATE THAT THIS TECHNIQUE CAN BE USED TO RAPIDLY AND SENSITIVELY DETECT MICROBIAL AGENTS IN CLINICAL SAMPLES. THIS TECHNIQUE WILL FIRST BE DEVELOPED FOR DETECTING E. COLI IN WATER SAMPLES.

EVAPORATED COATINGS INC
2365 MARYLAND RD
WILLOW GROVE, PA 19090
Program Manager: JOHN J WALLS JR
Contract #:
Title: OCULAR PROTECTION FROM LASER HAZARDS
Topic #: A90-192 Office: MEDICAL ID #: 39635

THIN FILMS, TODAY WIDELY USED IN NUMEROUS APPLICATIONS INCLUDING OPTICS, ELECTRONICS, AND SURFACE PROTECTION, ARE COMMONLY DEPOSITED BY A VARIETY OF PHYSICAL VAPOR DEPOSITION (PVD) METHODS. STANDARD PVD TECHNIQUES PRODUCE FILMS WITH INHERENT WEAKNESS OF THEIR OPTICAL AND MECHANICAL PROPERTIES BECAUSE OF THEIR TYPICAL COLUMNAR MICRO- STRUCTURE, WHICH IS A RESULT OF THE LOW MOBILITY OF THE CONDENSED ATOMS OR MOLECULES ON THE SUBSTRATE SURFACE. THIS IS PARTICULARLY TRUE FOR COATING OF PLASTICS, WHEN THE SUBSTRATE TEMPERATURE NEEDS TO BE KEPT LOW (AROUND AMBIENT). REACTIVE ION PLATING DEPOSITION (RIPD) IS AN INNOVATIVE TECHNIQUE WHICH DENSIFIES THE GROWING THIN FILM BY ENHANCED SURFACE MOBILITY AS WELL AS BY CONTINUOUS ION BOMBARDMENT, THEREFORE RESULTING IN DURABLE, WELL ADHERING THIN FILMS AT RELATIVELY LOW SUBSTRATE TEMPERATURES. THIS TECHNIQUE WILL BE USED FOR THE FUNDAMENTAL INVESTIGATION OF RIPD AS WELL AS FOR ITS PRODUCTION-ORIENTED APPLICATION. COMPREHENSIVE CHARACTERIZATION OF RIPD COATINGS WILL IMPROVE THE TECHNIQUE FURTHER.

PHYSICAL OPTICS CORP
25245 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR GAJENDRA SAVANT
Contract #:
Title: BROADBAND NEAR IR LASER HAZARD FILTERS
Topic #: A90-192 Office: MEDICAL ID #: 39634

PHYSICAL OPTICS CORPORATION (POC) PROPOSES TO EXTEND THE TECHNOLOGY THAT IT HAS RECENTLY DEVELOPED FOR IR REJECTION SOLAR CONTROL FILMS FOR APPLICATION TO LASER PROTECTIVE EYEWEAR. CURRENTLY, POC MANUFACTURES NEAR IR REFLECTIVE SOLAR CONTROL FILMS FOR AUTOMOTIVE AND ARCHITECTURAL GLASS APPLICATIONS OF BANDWIDTH 350 TO 400 nm. THE FILTER CUTS IN AT 700 nm AND CUTS OFF AT APPROZIMATELY 1050 nm. THIS PROGRAM PROPOSES TO STRETCH THE BANDWIDTH OF THIS HOLOGRAPHIC REFLECTION FILM TO APPROXIMATELY 450 nm SUCH THAT IT WOULD BLOCK ALL IR LASER THREATS STARTING AT 670 nm AND GOING OUT TO 1130 nm. THE ANGULAR PROTECTION PROVIDED BY THIS TECHNOLOGY WILL SUPPLY COMPLETE PROTECTION TO THE EYE FOR THE

ARRAY'S SPECTACLE, GOGGLE OR VISOR CONFIGURATIOS, AND UNLIKE ABSORPTION DYES, WILL NOT WEAKEN THE BALLISTIC IMPACT STRENGTH OF THESE DEVICES. THUS, FOR THE CON- FIGURATION ENVISIONED, POC WILL ADD NEAR IR PROTECTION AGAINST ALL LASER THREATS FROM 670 TO 1130 nm TO THE STANDARD ARMY EYEWEAR. THE EQUIPMENT WILL RETAIN AN OPTICAL DENSITY OF THREE OR BETTER USING ONE BROADBAND HOLOGRAPHIC LASER HAZARD FILTER.

STEADFAST INC
ONE KENDALL SQ - BLDG 600/2ND FL
CAMBRIDGE, MA 02139
Program Manager: F DONALD ROBERTS
Contract #:
Title: DEVELOPMENT OF NEW LASER-PROTECTIVE DYES
Topic #: A90-192 Office: MEDICAL ID #: 39636

A PROGRAM OF DEVELOPING NEW DYES FOR OCULAR PROTECTION AGAINST LASER RADIATION IS PROPOSED. TWO NEW FAMILITES OF DYES ARE IDENTIFIED, AND A METHOD OF PROTECTING THEM FROM DEGRADATION DUE TO HEAT AND LIGHT EXPOSURE IS INVESTIGATED. THE OUTPUT OF PHASE I IS A REPORT WHICH WILL IDENTIFY NEW LASER-PROTECTIVE DYES WITH DESIRABLE PROPERTIES; WILL DESCRIBE THE APPLICATION OF THE STABILIZATION TECHNIQUES FOR THESE DYES; AND WILL PROPOSE A PLAN FOR SYNTHESIS OF THESE NEW DYES TO BE CARRIED OUT IN PHASE II.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406
RADFORD, VA 24143
Program Manager: DR USHA V VASEASHTA
Contract #:
Title: LASER DEPOSITION OF MODULATED-STRUCTURE FERROELECTRIC THIN FILMS FOR NON-VOLATILE MEMORIES
Topic #: A90-193 Office: SDC ID #: 39637

FERROELECTRIC THIN FILM DEVICES OFFER A NUMBER OF ADVANTAGES FOR USE AS COMPUTER MEMORIES, INCLUDING HIGH BIT-DENSITY, NONVOLATILE LOW- VOLTAGE OPERATION OVER A WIDE TEMPERATURE RANGE, SHORT ACCESS AND CYCLE TIMES, AND RELATIVELY HIGH RADIATION HARDNESS. TO RESPOND TO THE NEED OF DESIGNIING AND DEVELOPING LIGHTWEIGHT, RADIATION HARD, HIGH PERFORMANCE ELECTRONIC CIRCUITS FOR USE IN INTERCEPTORS, ACTIVE AND PASSIVE SENSORS, AND DATA/SIGNAL PROCESSING DEVICES USED IN ANTI- SATELLITE APPLICATION, AMERICAN RESEARCH CORPORATION OF VIRGINIA SUGGESTS THE FABRICATION OF THIN FILM MODULATED STRUCTURES OF PT AND PZT FERROELECTRIC MATERIAL USING LOW TEMPERATURE LASER ABLATION TECHNIQUES. THE TARGET OF OPPORTUNITY IN THIS PROPOSAL IS THE DEVELOPMENT OF LOW-TEMPERATURE LASER DEPOSITION PROCESSES FOR THE PREPARATION OF MODULATED STRUCTURE FERROELECTRIC THIN FILMS WHICH WILL REQUIRE LOW SWITCHING FIELDS WHILE YIELDING A LARGE SIGNAL CHARGE. PROGRAM RESEARCH OBJECTIVES INCLUDE DESIGN OF A LOW-PRESSURE REACTOR, EVALUATION OF TARGET/SUBSTRATE GEOMETRY AND LASER EVAPORATION PARAMETERS, FABRICATION AND ANALYSIS OF FERROELECTRIC MATERIAL, AND FABRICATION AND ANALYSIS OF MODULATED STRUCTURE FERROELECTRIC THIN FILMS. THE TECHNIQUE OF LASER EVAPORATION OF FERROELECTRIC THIN FILMS OFFERS EXCELLECT CONTROL OVER CHEMICAL COMPOSITION AND RESULTING MICROSTRUCTURES AND IS EXPECTED TO BE EASILY ADAPTABLE TO DEVICE MANUFACTURING. THE INNOVATION IN THE PROPOSED TECHNOLOGY IS IN THE USE OF LASER-ASSISTED EVAPORATION TO PRODUCE HETERO-EPITAXIAL FILMS OF MULTILAYER PZT-PT COMPOSITION LEADING TO FASTER SWITCHING TIMES AND IMPROVED SIGNAL STRENGTH FOR FERROELECTRIC COMPUTER MEMORIES. SUCCESSFUL COMPLETION OF THE PROGRAM OBJECTIVES, WILL PROVIDE A MAJOR ADVANCE IN FERROELECTRIC THIN FILM QUALITY FOR DEVICE PRODUCTION.

IMPLANT SCIENCES CORP
35 CHERRY HILL DR
DANVERS, MA 01923
Program Manager: DR S N BUNKER
Contract #:
Title: BURIED SILICIDE INTERCONNECTIONS WITH BONDED WAFERS
Topic #: A90-193 Office: SDC ID #: 39638

COMPLEX MONOLITHIC INTEGRATED CIRCUITS ARE INCREASINGLY LIMITED BY THE NEEDS OF DEVICE INTERCONNECTIONS. EXISTING MATERIALS TAKE UP VALUABLE REAL ESTATE ON THE DIE, LIMIT CURRENT, AND ARE SUBJECT TO PARASITIC CAPACITANCES. THE USE OF MULTILEVEL AND 3D STRUCTURES HAS BEEN SUGGETED IN ORDER TO AVOID SOME OF THESE PROBLEMS. FORMATION OF CONDUCTORS BY ION IMPLANTATION SHOWS PROMISE FOR PROVIDING SUCH CONNECTORS IF CERTAIN PRACTICAL PROBLEMS CAN BE OVERCOME. NOVEL IMPLEMENTATION TECHNIQUES ARE PROPOSED WHICH WOULD DEMONSTRATE THE PRACTICALITY OF COMPLEX INTERCONNECTION PATTERNS.

L N K CORP
6811 KENILWORTH AVE - STE 306
RIVERDALE, MD 20737
Program Manager: TIMOTHY A ZIMMERLIN
Contract #:
Title: NEURAL NETWORK TARGET TRACKING AND RECOGNITION BASED ON MOTION VISION APPLIED TO ANTISATELLITE WEAPON SYSTEMS ACQUISITION TRACKING
Topic #: A90-194 Office: SDC ID #: 39639

LNK IS APPLYING A NEURAL ARCHITECTURE TARGET TRACKING AND STATE ESTIMATION SYSTEM BASED ON MOTION VISION INFORMATION FROM A PASSIVE 2D SENSOR. LNK IS DEVELOPING A HYBRID 2D SILHOUETTE AND 3D RELATIVE DEPTH MODEL-BASED TARGET RECOGNITION SYSTEM BASED ON THE ABOVE MOTION VISION INFORMATION. THE TRACKING AND STATE ESTIMATION PERFORMANCE HAVE PROVEN VERY ROBUST: DOWN TO SUBPIXEL TARGET SIZES, AS SLOW AS SUBPIXEL INTERFRAME SPEEDS, WITH UP TO 100 SIMULTANEOUSLY OVERLAPPING TARGETS, USING COMPLEX BACKGROUNDS. THIS WORK EFFORT EMPHASIZES CONTROLLED TEST AND EVALUATION TO SUPPORT PREDICTION AND OPTIMIZATION OF THE TRACKING AND RECOGNITION PERFORMANCE. THE RESULTS INCLUDE DEFINITION OF THE OPTIMAL CONCEPT, TEST AND EVALUATION RESULTS KEYED TO RESOLUTION AND S/N, APPLICATION DERIVED ENGINEERING REQUIREMENTS, AND A PLAN FOR FOLLOW ON DEVELOPMENT. THESE RESULTS ARE IN SUPPORT OF THE ANTISATELLITE ATR APPLICATION.

BBL RESEARCH INC
111 VILLA ANN
SAN ANTONIO, TX 78213
Program Manager: DR HAROLD LONGBOTHAM
Contract #:
Title: ROBUST MORPHOLOGICALLY BASED SAMPLING FOR ANN
Topic #: A90-195 Office: SDC ID #: 39640

THE PROBLEM OF INTEREST IS TO IMPROVE PATTERN RECOGNITION TECHNIQUES BY DECREASING THE TRAINING TIME FOR ARTIFICIAL NEURAL NETWORKS (ANN) AND INCREASING THE ROBUTNESS OF THE RECALL OF ANN. WE PROPOSE TO DECREASE TRAINING TIME BY INTRODUCING MORPHOLOGICALLY BASED RECON- FIGURABLE SAMPLING ARRAYS. WE WILL INCREASE THE FAULT TOLERANCE OR ROBUSTNESS OF OBJECT DETECTION TASKS BY INTRODUCING A HYBIRD MODEL THAT INCORPORATES ROBUST FILTERING PRIOR TO THE ANN INPUT. THERE ARE TWO PROBLEMS IN THIS AREA WE WOULD LIKE TO INVESTIGATE. AN OBVIOUS STEP IN DECREASING TRAINING TIME IS TO REDUCE THE NUMBER OF INPUTS AND THEREFORE THE NUMBER OF INTERCONNECTS. WE WILL INVESTI GATE THE EFFECTIVENESS OF THE

INTERCONNECTION OF SENSORS ON MORPHOLOGICAL "SHAPING" CONSIDERATIONS AND PRIOR KNOWLEDGE OF THE OBJECT OF INTEREST. THE SECOND PROBLEM WE WISH TO INVESTIGATE IS AN INCREASE IN THE ROBUTNESS OF ANNS FOR BOTH IMPULSIVE NOISE AND VARYING SENSOR OUTPUT AMPLITUDES DUE TO VARYING INPUT INTENSITIES. WE WILL EXAMINE IMPULSIVE NOISE VIA THE USE OF ORDER STATISTIC (OS) FILTERS SUCH AS THE MEDIAN AFTER AN MORPHOLOGICALLY BASED INTERCONNTECTION OF THE SENSORS. WE WILL APPROACH THE PROBLEM OF VARYING INTENSITIES BY RENORMALIZATION OF THE INPUTS FROM THE MORPHOLOGICALLY SELECTED SET OF SENSORS TO THE ANN.

DESE RESEARCH INC
2700 TRIANA BLVD
HUNTSVILLE, AL 35807
Program Manager: DR ROBERT M SMITH
Contract #:
Title: SENSOR SIGNAL AND DATA PROCESSING - IMAGE ENHANCEMENT
Topic #: A90-195 Office: SDC ID #: 39641

IMAGE PROCESSING ALGORITHMS FOR MODERN OPTICAL (AND RADAR) SENSORS ARE INTRODUCED FOR (1) TEST FOR OUTLIERS, (2) LOS ESTIMATES, (3) EDGE DETERMINATIONS, (4) SHAPE DEFINITIONS, (5) AIMPOINTS AND, (6) DISTANCE ESTIMATES. UNIQUE IS THE DEVELOPMENT OF REAL-TIME EFFICIENT PROCESSING SCHEMES BASED UPON PAIR-WISE MANIPULATION OF DATA POINTS. DEPENDING ON THE QUALITY OF IMAGES, NEAR INSTANTANOUS ASSESSMENTS OF TARGET PARAMETERS ON A STATISTICAL BASIS ARE OBTAINED. WHEN OBSERVED OVER A PERIOD OF TIME, IMPROVED PROBABILITIES OF DEFINITION ARE OBTAINED EVEN WHEN IMAGE PROPERTIES CHANGE DRAMATICALLY. THE OUTLIER TESTS WHERE IMAGES ARE SEPARATED FROM EXTRANEOUS OBSERVABLES RELATE TO PROBLEMS ASSOCIATED WITH MULTIPLE TARGET PROCESSING, AND STRUCTURAL BACKGROUND REMOVAL AS WELL AS THE DETAILS OF OBJECT DEPENDANT PROCESSING. PHASE I WORK FOCUSES ON DEVELOPMENT OF PAIR-WIE PROCEDURES AND DEMONSTRATIONS. A PLAN IS ALSO DEVELOPED FOR PHASE II CONTINUATION WHERE A NUMBER OF PROCESSING ALGORITHMS WILL BE DEVELOPED.

OPTRON SYSTEMS INC
3 PRESTON CT
BEDFORD, MA 01730
Program Manager: THOMAS HO..SKY
Contract #:
Title: INVESTIGATION OF VACUUM MICROELECTRONIC FIELD EMITTER ARRAY TECHNOLOGY FOR OPTICAL SIGNAL PROCESSING
Topic #: A90-196 Office: SDC ID #: 39642

OPTICAL SIGNAL PROCESSING IS COMMONLY IDENTIFIED AS ONE OF THE MAJOR TECHNOLOGIES THAT MUST BE EXPLOITED IN THE DEVELOPMENT OF SUPER HIGH BANDWIDTH PROCESSORS. THE NEED FOR INCREASED PROCESSING POWER IN SMALL AND ROBUST PACKAGES IS ESPECIALLY ACUTE FOR THE NEXT GENERATION OF ASAT WEAPONS SYSTEMS, BUT DEVELOPMENT OF VIABLE OPTICAL COMPUTING DEVICES HAS BEEN SLOW. THE MOST BASIC AND CRITICAL OPTICAL COMPONENT IS THE SPATIAL LIGHT MODULATORS (SLM). FOR EXAMPLE, THE SLM IS AN ESSENTIAL PART OF OPTICAL CORRELATORS THAT MAY BE USED FOR MULTI-TARGET DETECTION, ACQUISITION AND TRACKING. WE PROPOSE A NEW BREED OF SLMS BASED ON THE RELATIVELY RECENT PROGRESS IN INTEGRATED VACUUM MICROELECTRONICS. ADVANCES IN FABRICATION AND PROCESSING TECHNIQUES HAVE MADE IT POSSIBLE TO PRODUCE INTEGRATED ARRAYS OF THOUSANDS OF COLD CATHODE ELECTRON EMITTERS. THESE DEVICES ARE SUPERIOR TO THERMIONIC CATHODES AND MICROCHANNEL ELECTRON MULTIPLIERS IN SEVERAL RESPECTS INCLUDING OUTPUT CURRENT DENSITY, SIZE, RUGGED-NESS, RADIATION HARDNESS AND SPEED. THE PROPOSED WORK PLAN AIMS TO DETERMINE THE FEASIBILITY OF FIELD EMITTER TECHNOLOGY FOR SPATIAL LIGHT MODULATOR DEVICES. EMITTER ARRAYS WILL BE EXPERIMENTALLY CHARACTERIZED AND

A PROTOTYPE ELECTROOPTIC MODULATOR WILL BE DEMONSTRATED IN PHASE I. DESIGN OF A 2-D MODULATOR WILL BE CONSIDERED, INCLUDING OPTIMIZED ADDRESSING SCHEMES FOR INCREASIG DATA FRAME RATES.

PHOTEL INC
5950 DALEY ST
GOLETA, CA 93117
Program Manager: M K KILCOYNE
Contract #:
Title: OPTICAL COMPUTING AND OPTICAL SIGNAL PROCESSING TECHNOLOGY
Topic #: A90-196 Office: SDC ID #: 39643

RECENT ADVANCES IN OPTOELECTRONIC MODULATORS DESIGN AND RELATED SUPERLATTICE AND MULTIPLE-QUANTUM-WELL MATERIALS MAY ENABLE THE CREATION OF A NEW CLASS OF OPTOELECTRONIC CIRCUITS FOR APPLICATIONS IN OPTICAL INTERCONNECTION, OPTIAL LOGIC GATES, SPATIAL-LIGHT- MODULATORS AND NEW BISTABLE CONFIGURATIONS. THE OBJECTIVE OF THIS WORK IS TO EXPLORE THE USE OF NEW LOW-DRIVE-VOLTAGE FABRY-PEROT MODULATORS, RECENTLY CONCEIVED AT UC-SANTA BARBARA, IN THESE APPLICATIONS, AND IN LATER PHASES, TO DEVELOP HYBRID AND MONOLITHIC OPTOELECTRONIC CIRCUITS FOR COMMERCIAL AND MILITARY OPTICAL INTER- CONNECTION AND LOGIC APPLICATIONS. BECAUSE OF THE LOW CAPACITANCE AND LOW VOLTAGE REQUIREMENTS OF THE MODULATORS, SUCH CIRCUITS SHOULD OPERATE AT HIGHER SPEEDS AND WITH LOWER POWERS THAN PRESENTLY POSSIBLE. COMMERCIAL APPLICATIONS INCLUDE OPTICAL TRANSMITTERS AND RECEIVERS, INTRA- AND INTER-COMPUTER COMMUNICATIONS, RECONFIGURABLE INTERCONNECTS (PHOTONIC SWITCHING) AND OPTOELECTRONIC COMPUTING.

ORINCON CORP
9363 TOWNE CENTRE DR
SAN DIEGO, CA 92121
Program Manager: DR LAWRENCE J FOGEL
Contract #:
Title: ROBOTICS AND ARTIFICIAL INTELLIGENCE
Topic #: A90-197 Office: SDC ID #: 39644

EVOLUTIONARY PROGRAMMING WILL BE INVESTIGATED AS A MEANS FOR OPTIMIZING AN ASAT BATTLE MANAGEMENT SCENARIO. EVOLUATIONARY PROGRAMMING IS A STOCHASTIC PROCESS, SIMULATING DARWINIAN EVOLUTION FOR THE PURPOSE OF DISCOVERING THE MOST APPROPRIATE LOGIC FOR SOLVING THE PROBLEM AS POSED. RELATIVELY FEW UNDERLYING ASSUMPTIONS ARE REQUIRED. SIMULATED EVOLTION WILL BE PROGRAMMED IN ORDER TO MEASURE THE EFFECTIVENESS OF THE EVOLUTIONARMY PROGRAMMING TECHNIQUE USING A SUITABLE COMBAT SIMULATION. EVOLUTIONARY PROGRAMMING WILL BE COMPARED IN EFFICIENCY TO THE GENETIC EVOLUTIONARY ALGORITHM.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: THOMAS H RIVERS
Contract #:
Title: COMMERCIAL-OFF-THE-SHELF SOFTWARE ASSESSMENT TOOL
Topic #: A90-198 Office: SDC ID #: 39646

COMMERCIAL-OFF-THE-SHELF (COTS) SOFTWARE PLAYS AN EXTREMELY IMPORTANT ROLE IN THE TIMELY AND EFFICIENT FIELDING OF OPERATIONAL SYSTEMS. HOWEVER, THERE EXISTS ONE MAJOR DRAWBACK WITH THE UTILIZATION OF COTS SOFTWARE. THIS DRAWBACK IS THE LACK OF A THOROUGH

UNDERSTANDING AND EVALUATION OF EXACTLY HOW THE COTS SOFTWARE OPERATES. THIS PROBLEM EXISTS DUE TO THE FACT THAT MOST COTS SOFTWARE IS PROPRIETARY, THEREFORE SOURCE CODE IS NOT AVAILABLE FOR EVALUATION. AS A RESULT, THE POTENTIAL USER OF THE COTS SOFTWARE IS LEFT AT THE MERCY OF THE COTS SOFTWARE DEVELOPER. THE COTS PRODUCT MAY CONTAIN CODING ERRORS OR EVEN MORE CRITICAL, IT MAY CONTAIN MALICIOUS CODE. THIS EFFORT PROPOSES A SOLUTION TO THIS PROBLEM IN THE FORM OF AN INTERACTIVE SOFTWARE TOOL THAT ASSESSES THE THREAT TO THE OPERATIONAL SYSTEM PRESENTED BY THE COTS PRODUCT. IN PROVIDING THIS ASSESSMENT A KEY COMPONENT THAT IS ANALYZED IS THE OPERATIONAL CHARACTERISTICS REQUIRED BY THE COTS PRODUCT FOR ITS NORMAL OPERATION. THIS SERVES TO IDENTIFY WHAT CAPABILITIES THAT THE COTS PRODUCT COULD HAVE ACCESS TO IN THE OPERATIONAL SYSTEM GIVEN AN ERRANT CONDITION OR MALICIOUS CODE EXISTED WITHIN THE COTS PRODUCT. A FURTHER GOAL OF THIS EFFORT IS TO DEFINE THE DESIGN REQUIREMENTS FOR A COTS CONTAINMENT SHELL BASED ON THE OUTCOME OF THE ASSESSMENT TOOL EFFORT AND DETERMINE THE VIABILITY OF SUCH A PRODUCT.

STOTTLER HENKE ASSOCS
2205 HASTINGS DR - #38
BELMONT, CA 94002
Program Manager: RICHARD STOTTLER
Contract #:
Title: AUTOMATIC TRANSLATION OF EXPERT SYSTEMS TO A NEURAL NETWORK REPRESENTATION
Topic #: A90-198 Office: SDC ID #: 39645

THE PRIMARY OBJECTIVE OF THIS PHASE I EFFORT IS TO DESIGN AND IMPLEMENT A SOFTWARE PROTOTYPE FOR AUTOMATICALLY TRANSLATION EXPERT SYSTEMS INTO A NEURAL NETWORK REPRESENTATION TO ALLOW EXPERT SYSTEMS TO DERIVE BENEFITS OF NEURAL NETWORKS, INCLUDING ADAPTABILITY, IMPROVED REAL-TIME PERFORMANCE, FAULT TOLERANCE AND THE ABILITY TO GENERALIZE. THE NEURAL NETWORK CAN BE READILY TRANSITIONED TO A PARALLEL PROCESSING MACHINE AND MAKE FULL USE OF ALL ITS PROCESSORS. PHASE I WILL CULMINATE IN AN ARCHITECTURE DESIGN FOR A COMPLETE AUTOMATIC TRANSLATION PRODUCT WHICH WILL BE APPLICABLE TO AT LEAST ONE EXPERT SYSTEM BUILDING TOOL. NEURAL NETWORK ARCHITECTURES WITH HUNDREDS OF THOUSANDS OF SIMPLE PROCESSING ELEMENTS WILL SOON BE AVAILABLE. AN EXPERT SYSTEM TO NEURAL NETWORK TRANSLATION FACILITY WILL ALLOW EXPERT SYSTEMS TO TAKE FULL ADVANTAGE OF THIS POWER FOR THE ASAT PROGRAM.

OPTRON SYSTEMS INC
3 PRESTON CT
BEDFORD, MA 01730
Program Manager: CRAIG SCHILLER
Contract #:
Title: OPTICALLY-ADDRESSED MEMBRANE SPATIAL LIGHT MODULATOR FOR AN ADAPTIVE OPTICS SYSTEM IN LASER COMMUNICATION NETWORKS
Topic #: A90-199 Office: SDC ID #: 39648

THE USE OF LASER SYSTEMS FOR OPTICAL COMMUNICATION IS EXPECTED TO BE WIDELY IMPLEMENTED IN THE FUTURE. THIS PROPOSAL ADDRESSED THE CRITICAL TECHNOLOGICAL ISSUES OF WAVEFRONT CORRECTING A LASER BEAM FOR SATELLITE OPTICAL COMMUNICATION UNDER A DYNAMIC OPERATING ENVIRONMENT AND STRINGENT MISSION REQUIREMENTS. OPTRON SYSTEMS PROPOSES TO DEVELOP AN OPTICALLY ADDRESSED 2-D PHASE MODULATOR BASED ON DEFORMABLE MIRROR TECHNOLOGY. THIS DEVICE OVERCOMES THE LOW RESOLUTION, SLOW FRAME RATES, HIGH COST AND DYNAMIC-RANGE LIMITATIONS OF PRESENTLY AVAILABLE SYSTEMS. WITH THE ADDITION OF A WAVEFRONT SENSOR AND A FEEDBACK PATH, THE MODULATOR IS READILY INCORPORATED INTO CLOSED-LOOP SYSTEMS FOR AUTOMATIC WAVEFRONT CORRECTION. THE PHASE I PROGRAM INVOLVES DEVICE DESIGN OPTIMIZATION AND MODELLING, COMPONENT DEVELOPMENT AND TESTING, AND THE DEMONSTRATION OF A PROTOTYPE

MODULATOR. THE PROTOTYPE MODULATOR IS EXPECTED TO EXHIBIT 10(4) RESOLUTION ELEMENTS, FRAMING RATES OF AT LEAST 100Hz, AND A DEPTH OF PHASE MODULATION OF AT LEAST 7psi. IN THE PHASE II PROGRAM, WITH FURTHER DEVELOPMENT, WE EXPECT TO UPGRADE THE PERFORMANCE OF THE PROTOTYPE DEVICE AND MEET, AT THE VERY LEAST, ALL THE REQUIREMENTS OF THE OPERATIONAL STAGE (100-200 Hz, 512x512 PIXELS) AND DEMONSTRATE WAVEFRONT CORRECTION CAPABILITY.

PHYSICAL OPTICS CORP
2545 W 237TH ST - STE B
TORRANCE, CA 90505
Program Manager: DR CHAI PEI KUO
Contract #:
Title: PHASE AND BEAM LOCKING OF LASER DIODE ARRAYS USING PHASE CONJUGATE RESONATORS
Topic #: A90-199 Office: SDC ID #: 39647

PHYSICAL OPTICS CORPORATION PROPOSES AN INNOVATIVE TECHNICAL APPROACH TO ACHIEVE SIMULTANEOUS PHASE-LOCKING AND BEAM COMBINING OF A LASER DIODE ARRAY. THIS APPROACH RELIES ENTIRELY ON PHOTOREFRACTIVE PHASE CONJUGATE OPTICS, THUS AVOIDING THE ALIGNMENT SENSITIVITY OF OTHER EXTERNAL OPTICAL TECHNIQUES. ONE OF THE PRINCIPAL FEATURES OF A LASER WITH A PHASE CONJUGATE RESONATOR CAVITY IS THAT ITS OUTPUT IS VERY TOLERANT OF INTRACAVITY DISORIENTATION. THIS SUGGESTS THE POSSIBILITIES OF USING PHASE CONJUGATION TO COHERENTLY COUPLE THE GAIN MEDIA FROM SEVERAL DIODE LASERS TOGETHER IN A SINGLE PHASE CONJUGATE RESONATOR PRODUCING A DIFFRACTION LIMITED OUTPUT BEAM WHICH COMBINES THE POWER OF THE INDIVIDUAL LASERS. AN INNOVATIVE RING PHASE CONJUGATE CAVITY GEOMETRY AND A DOUBLE PHASE CONJUGATE GEOMETRY, UTILIZING SINGLE ELEMENT PHOTOREFRACTIVE BaTiO3 CRYSTAL, ARE PROPOSED FOR THE LONG TERM STABLE LOCKING OF LASER DIODE ARRAYS WITH SINGLE MAIN LOBE OUTPUT. THESE CONFIGURATIONS CAN ACHIEVE SEVERAL IMMEDIATE ADVANTAGES BY OBTAINING A HIGH QUALITY LASER DIODE SOURCE AS A FUNDAMENTAL BUILDING BLOCK OF LASER COMMUNICATION SYSTEMS. THEY ARE: 1) HIGH POWER, HIGH-BRIGHTNESS LASER DIODE SOURCES WITH COMPACT SIZE; 2) ENVIRONMENTAL INSENSITIVITY AND HIGH BEAM QUALITY; AND 3) LONG LIFE TIME AND LOW POWER CONSUMPTION.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
Program Manager: RICHARD W LUSIGNEA
Contract #:
Title: ORDERED POLYMERS FOR HIGH PERFORMANCE KINETIC ENERGY DEVICES
Topic #: A90-200 Office: SDC ID #: 39649

THE PROPOSED WORK WILL INVOLVE EVALUATION OF ORDERED POLYMER FILM AND FILM LAMINATE COMPOSITES FOR APPLICATIONS SUCH AS ROCKET MOTOR CASES, PRESSURE VESSELS AND OTHER CYLINDRICAL COMPONENTS. THE OBJECTIVE OF THEPROGRAM IS TO MAKE HIGH QUALITY FILM LAMINATES USING FABRICATION PROCESSES THAT ARE AMENABLE TO SCALE-UP. TEST SAMPLES WILL BE MADE, TESTED AND COMPARED WITH OTHER HIGH PERFORMANCE COMPOSITE MATERIALS. FOSTER-MILLER H \S DEVELOPED PROCESSING METHODS FOR MAKING HIGH STRENGTH FILMS FROM PBO (... BENZOBISOXAZOLE), AN ORDERED ROD-LIKE POLYMER PROCESSED FROM LIQUID CRYSTAL POLYMER .... PBO FILM CAN PROVIDE PERFORMANCE IMPROVEMENT BY VIRTUE OF EXCELLENT MECHANICAL PROPERTIES, THERMAL AND ENVIRONMENTAL RESISTANCE, AND THE GEOMETRIC EFFICIENCY OF TAPE REINFORCEMENT OVER FIBER-REINFORCED COMPOSITES. THE PROPOSED PHASE I PROGRAM WILL EVALUATE PBO FILM LAMINATES AND METHODS FOR PRODUCING ROCKET MOTOR CASES AND OTHER CYLINDRICAL STRUCTURES.

CHRONOS RESEARCH LABS INC
4186 SORRENTO VALLEY BLVD - STE H
SAN DIEGO, CA 92121
Program Manager: DR RANDALL B OLSEN
Contract #:
Title: HIGH POWER DENSITY ELECTRICAL PULSE SOURCE
Topic #: A90-201 Office: SDC ID #: 39650

THERMAL ENERGY CAN BE USED TO DRIVE A NEW TYPE OF ELECTRICAL POWER SUPPLY. IN A ONE-SHOT, DESTRUCTIVE HEATING MODE, THE AMOUNT OF ELECTRICAL POWER RELEASE WILL BE MORE THAN 45 MEGAWATT/KG OF PYROELECTRIC SHEET. MULTIPLE-SHOT DEVICES ARE POSSIBLE WITH SOME REDUCTION IN THIS POWER DENSITY. THE PYROELECTRIC PULSE SUPPLY OFFERS SEVERAL ORDERS OF MAGNITUDE IMPROVEMENT OVER CONVENTIONAL TECHNOLOGY IN POWER DENSITY, ENERGY DENSITY AND COST. THE ENERGY DENSITY OF THIS SOURCE IS OVER 500 TIMES GREATER THAN HIGH ENERGY DENSITY CAPACITORS, AND 9 TIMES GREATER THAN ADVANCED LIGHTWEIGHT HOMOPOLAR GENERATORS. THE PHASE I EFFORT WILL DEMONSTRATE RAPID ELECTRICAL PULSE EXTRACTION FROM A SPECIFIC PYROELECTRIC MATERIAL.

INNOVATIVE SOLUTIONS FROM ADV TECH INC
7375 BOSTON BLVD - STE 110
SPRINGFIELD, VA 22153
Program Manager: ROBERT LEITNER
Contract #:
Title: LIGHTWEIGHT LOW VOLUME INTEGRATED SPACECRAFT STRUCTURES AND ENERGY STORAGE
Topic #: A90-201 Office: SDC ID #: 39651

A RECENT BREAKTHROUGH IN THERMOPLASTIC MATERIALS TECHNOLOGY NOW PERMITS PRACTICAL, LIGHTWEIGHT, LOW VOLUME INTEGRATED STRUCTURE/ ENERGY STORAGE SYSTEMS TO BE FABRICATED. THESE MATERIALS WILL PERMIT SPACECRAFT WEIGHT AND VOLUME SAVINGS WHICH ARE NOT POSSIBLE WITH ANY OTHER SEPARATE STRUCTURE/SECONDARY BATTERY COMBINATION WHICH IS NOW UNDER CONSIDERATION. THIS PROPOSAL DESCRIBES A PHASE I CONCEPT FEASIBILITY ANALYSIS AND MATERIAL LABORATORY DEMONSTRATION. PHASE II WILL DEMONSTRATE THE FEASIBILITY AND PAYOFFS OF A PROTOTYPE INTEGRATED "POWER STRUCTURE."

AEROMET INC
PO BOX 701767
TULSA, OK 74170
Program Manager: CALVIN L POWELL
Contract #:
Title: SATELLITE KILL ASSESSMENT SPECTROSCOPY
Topic #: A90-202 Office: SDC ID #: 40949

TO MEET THE KINETIC ENERGY ANTI-SATELLITE (KE ASAT) REQUIREMENTS FOR TIMELY AND RELIABLE KILL ASSESSMENT, AEROMET PROPOSES TO RECOMMEND INNOVATIVE TECHNIQUES IN REAL-TIME KILL ASSESSMENT SPECTROSCOPY. BECAUSE IT CAN BE CRITICALLY IMPORTANT TO ACCURATELY VERIFY SATELLITE ELIMINATION, A KILL ASSESSMENT SYSTEM MUST DISCERN BETWEEN VARIOUS HIT AND MISS PHENOMENA, INCLUDING THE USE OF POTENTIAL COUNTERMEASURES. AEROMET, INC. WILL HAVE THE SUPPORT OF ROCKWELL INTERNATIONAL CORPORATION CHEMICAL KINETICISTS TO DEFINE THESE PHENOMENA. AEROMET WILL ASSESS THE SPECTRAL, SPATIAL AND TEMPORAL FEASIBILITY OF VARIOUS SPECTROSCOPIC TECHNOLOGIES BASED UPON THE PREDICTED ASAT ENCOUNTER PHENOMENA.

POTOMAC SYNERGETICS INC (PSI)
PO BOX 953

McLEAN, VA 22101
Program Manager: V J CORCORAN
Contract #:
Title: PHASE CONJUGATE LASER COUNTERMEASURES
Topic #: A90-202 Office: SDC ID #: 39652

POTOMAC SYNERGETICS, INC. (PSI), A WOMAN-OWNED SMALL BUSINESS, PROPOSES TO INVESTIGATE THE USE OF PHASE CONJUGATE TECHNIQUES AS LASER COUNTERMEASURES. THREE GENERIC SYSTEMS CONCEPTS ARE SUGGESTED WHICH WILL BE INVESTIGATED AND EVALUATED. A FOUR TASK PHASE I PROGRAM IS PROPOSED TO DETERMINE WHICH TECHNIQUE OFFERS THE MOST PROMISE TO FULFILL THE NEEDS OF THE ARMY STRATEGIC DEFENSE COMMAND. THIS TECHNIQUE WILL BE IMPLEMENTED IN PHASE II. THE CHOSEN SYSTEM IS EXPECTED TO BE CAPABLE OF AUTOMATICALLY TRACKING AND DESTROYING MANY SYSTEMS (TARGETS) WITH A MAXIMUM OF ECONOMY AND SIMPLICITY. IN ADDITION, THE TECHNIQUE IS ALIGNMENT INSENSITIVE AND PRECISE POINTING IS INHERENT IN THE CONCEPT WITHOUT LARGE, EXPENSIVE GIMBALS. ALSO, THE TECHNIQUE WILL BE APPLICABLE OVER A BROAD SPECTRAL RANGE. AS A COMPANY, PSI HAS BOTH ANALYTICAL AND EXPERIMENTAL EXPERIENCE WITH THE TECHNOLOGIES AND SYSTEMS THAT ARE IMPORTANT FOR THE SUCCESS OF THE PROGRAM. IN ADDITION TO WORKING ON THE INDIVIDUAL TECHNOLOGIES OF IMPORTNACE TO LASER COUNTERMEASURES, PSI HAS DESIGNED, ASSEMBLED AND TESTED A SYSTEM SPECIFICALLY FOR COUNTERMEASURES OF SENSORS, WHICH ARE ESSENTIAL COMPONENTS IN LASER WEAPONS SYSTEMS.

ADVANCED FUEL RESEARCH INC
PO BOX 380343 - 87 CHURCH ST
EAST HARTFORD, CT 06138
Program Manager: PETER R SOLOMON
Contract #:
Title: FLAME SYNTHESIS OF DIAMOND FILAMENTS FOR A COMPOSITE MATERIAL
Topic #: A90-203 Office: SDC ID #: 39654

COMPOSITES OFFER THE POTENTIAL FOR OBTAINING MATERIALS WITH SIGNIFICANTLY IMPROVED STRUCTURAL PROPERTIES (STIFFNESS, DAMAGE TOLERANCE, HIGH TEMPERATURE CAPABILITIES) COMPARED TO THAT OF ANY OF THE INDIVIDUAL COMPONENTS ALONE. DIAMOND WOULD BE A VERY INTERESTING COMPONENT IN A COMPOSITE MATERIAL BECAUSE OF ITS EXTRAORDINARY HARDNESS, HIGH ELASTIC MODULUS, LOW COMPRESSIBILITY, LOW THERMAL EXPANSION AND RESISTANCE TO CHEMICAL ATTACK. THIS PROPOSAL OFFERS THE DEVELOPMENT OF A PROCESS FOR GROWING DIAMOND FILAMENTS USING FLAME CHEMICAL VAPOR DEPOSITION (CVD). RESEARCH IN OUR LABORATORY DURING THE PAST YEAR HAS CONFIRMED HIGH GROWTH RATES OF DIAMONDS IN ACETYLENE FLAME AND, IN ADDITION, HAS SHOWN THAT UNDER CERTAIN CIRCUMSTANCES, DIAMOND FILAMENTS (APPROACHING SINGLE CRYSTALS) ARE FORMED. BY OPTIMIZING THE FLAME AND SUBSTRATE CONDITIONS IT SHOULD BE POSSIBLE TO GROW DIAMOND FILAMENTS IN A CONTINUOUS PROCESS. PHASE I RESEARCH WILL CONSTRUCT A NOVEL FLAME REACTOR TO ELUCIDATE THE GROWTH CHEMISTRY OF DIAMOND FILAMENTS BY FLAME CVD. IN-SITU DIAGNOSTICS WILL PROVIDE IMPORTANT INFORMATION ABOUT THE GROWTH ENVIRONMENT. USING THESE TWO ASPECTS, THE PHASE I RESEARCH WILL DEMONSTRATE THE DEPOSITION OF SHORT SINGLE CRYSTAL DIAMOND FILAMENTS. THE FILAMENTS WILL BE HIGH QUALITY (LOW GRAPHITE CONTENT AND GOOD UNIFORMITY) AND BE AT LEAST 1 mm LONG. PHASE II WILL SYSTEMATICALLY IMPROVE THE SIZE AND GROWTH RATE OF THE FILAMENTS UNTIL SINGLE CRYSTAL GROWTH OF DIAMOND FILAMENTS OF ARBITRARY LENGTH IS ACHIEVED.

CORDEC CORP
PO BOX 188 - 8270-B CINDER BED RD
LORTON, VA 22079
Program Manager: DR RAYMOND J WEIMER
Contract #:

Title: INTEGRALLY STIFFENED GRAPHITE/MAGNESIUM PANELS
Topic #: A90-203 Office: SDC ID #: 39653

LARGE, PERIODIC TEMPERATURE EXCURSIONS CAUSE SIGNIFICANT DIMENSIONAL CHANGES IN LARGE ORBITING SPACE STRUCTURES. SIMILARLY, LARGE GROUND-BASED ANTENNAS AND OPTICAL SYSTEMS ARE SUBJECT TO DIURNAL DIMENSIONAL CHANGES THAT DIMINISH PRECISION AND SENSITIVITY. OUR RECENTLY DEVELOPED GRAPHITE/MAGNESIUM METAL MATRIX COMPOSITES (MMC) HAVE BEEN SHOWN TO BE DIMENSIONALLY STABLE (ZERO CTE AND ZERO HYSTERESIS) FROM -200 TO +300 DEGREES CENTIGRADE. WITH DENSITY OF 2g/cc, TENSILE STRENGTH OF 80 ksi, AND YOUNG'S MODULUS OF 50 Msi, SUCH MATERIALS ARE EXCEPTIONAL CANDIDATES FOR STIFFENED STRUCTURAL PANELS. BOTH INTEGRALLY STIFFENED AND HONEYCOMB PANELS WILL BE DEMONSTRATED AND EVALUATED IN THIS PROJECT.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE A220
ALBUQUERQUE, NM 87110
Program Manager: JAMES H BOSCHMA
Contract #:
Title: DIRECTED GAMMA RADIATION BEAM
Topic #: A90-204 Office: SDC ID #: 39656

A FEASIBILITY STUDY IS PROPOSED ON A NOVEL CONCEPT FOR A GENERATION OF A VERY LIGHTWEIGHT, HIGHLY FOCUSED GAMMA RADIATION BEAM USEFUL FOR MULTIPLE APPLICATIONS IN DEFENSE SUCH AS KILL OF ELECTRONIC SYSTEMS IN LAND WARFARE, AND (AS DESCRIBED HEREIN) DISCRIMINATION OF TARGETS IN SPACE. THE DEVICE IS SMALL ENOUGH TO "PIGGY BACK" ON THE PROPOSED REENTRY VEHICLE (RV) INTERCEPTOR MISSILES, OR BE CARRIED IN CONVENTIONAL ARTILLERY AND TANK PROJECTILES FOR USE IN LAND WARFARE. THIS CONCEPT UTILIZES AN EXPLOSIVELY COLLAPSED BETATRON TO GENERATE HIGH ENERGY ELECTRONS WHICH ARE THEN DIRECTED INTO A CONVERTER SHIELD COMPOSED OF DENSE METAL SUCH AS TANTALUM. THE KINETIC ENERGY OF THE ELECTRONS IS THEN CONVERTED TO GAMMA RADIATION WHICH IS PROJECTED FORWARD IN A HIGHLY FOCUSED, BEAM-LIKE GEOMETRY. ELECTRONIC KILL OR TARGET DISCRIMINATION OCCURS WHEN THE GAMMA RAYS PENETRATE INTO OBJECTS IN THEIR PATH, INTERACTING WITH THE ATOMIC STRUTURES OF THE TARGETS, THUS CAUSING DAMAGE AND MEASURABLE SECONDARY EMISSIONS. THIS PROPOSAL ADDRESSES USE OF THE DGRB IN THE EXOATMOSPHERIC DISCRIMINATION ROLE, ONE OF THE POSSIBLE APPLICATIONS FOR THIS DIRECTED ENERGY BEAM.

LASER TOOLS INC
7800 SMOKE RISE RD SE
HUNTSVILLE, AL 35802
Program Manager: DAVID W HOWGATE
Contract #:
Title: PHOTON-GUN DEMONSTRATOR
Topic #: A90-204 Office: SDC ID #: 39655

WE PROPOSE IN PHASE I TO DEMONSTRATE, USING AVAILABLE TECHNOLOGY AND RESOURCES, THE FEASIBILITY OF A "PHOTON-GUN" DEMONSTRATOR CONCEPT THAT COMBINES THE INDUCED-DIPOLE STORAGE LASER CONCEPT PIONEERED BY THE SOVIETS IN THE EARLY 1970'S WITH STATE-OF-THE-ART TRAVELING WAVE (OR LASER) INDUCED PULSE EXTRACTION AND THE TRADITIONAL HARDWARE DESIGN STRUCTURE OF AN IDENTIFIABLE PROJECTILE/CARTRIDGE/LAUNCHER ASSEMBLY OR SYSTEM. ON THE BASIS OF PHASE I INPUT, WE PROPOSE DURING PHASE II TO DEMONSTRATE THIS CONCEPT FIRST WITH AN ABBREVIATED GAIN SECTION AND FINALLY WITH A COMPLETE PROTOTYPE SCALED FOR KILOJOULE PULSE OUTPUT USING MOLECULAR HYDROGEN AS THE HOST MEDIUM. THE PROPOSED EFFORT IS THE CULMINATION OF OVER TWENTY YEARS OF PREPARATORY STUDIES AND BREAKTHROUGHS PIONEERED BY

THE OFFERORS IN DIPOLE-INDUCTION, LOW DIPOLE MOMENT LASERS, SWEPT-GAIN SUPER- RADIANCE, LASER SYSTEM DESIGN AND OPERATION, KINETICS AND OPTICS MODELING, AND MATTER/FIELD THEORY. WE FEEL A VARIETY OF POTENTIAL DOD APPLICATIONS ARE FORTHCOMING FROM SINGLE PULSE/EXPENDABLE CARTRIDGE/MEGAJOULE OPTIONS TO MULTIPLE PULSE REUSEABLE CARTRIDGE DESIGN. THE ULTIMATE GOAL IS TO ENCOMPASS A SPECTRUM OF PHOTON ENERGIE THROUGH THE INTERROGATION OF SELECTED METASTABLE-TYPE HOST-MEDIUM CANDIDATES AND THE USE OF FREQUENCY CONVERSTION TECHNIQUES SUCH AS RAMAN ANTISTOKES SCATTERING.

CONDUCTUS INC
969 W MAUDE AVE
SUNNYVALE, CA 94086
Program Manager: JOHN M ROWELL
Contract #:
Title: A NOVEL IR DETECTOR FOR SURVEILLANCE AND EARLY DETECTION
Topic #: A90-205 Office: SDC ID #: 40950

CONDUCTUS, INC., IN CONJUNCTION WITH LAWRENCE BERKELEY LABORATORY (LBL) AND THE UNIVERSITY OF CALIFORNIA AT BERKELEY, HAS DEVELOPED A CONCEPT CALLED THE "ANTENNA COUPLED HIGH TEMPERATURE SUPERCONDUCTING MICROBOLOMETER," WHICH HAS THE POTENTIAL TO PROVIDE SENSITIVITY AND RESPONSE EXCEEDING THAT ANY OTHER KIND OF LONG WAVELENGTH INFRARED DETECTOR OPERATING AT 77 F OR HIGHER TEMPERATURE. IN ADDITION, THE CONDUCTUS MICROBOLOMETER PROMISES TO BE INTRINSICALLY VERY RESISTANT TO DAMAGE OR UPSET BY EITHER IONIZING OR LASER RADIATION. THE BOLOMETER MAY ALSO BE USED, IF DESIRED, TO DETECT SUB-MM, MM, AND MICROWAVE RADIATION. THE VERY HIGH SENSITIVITY AND RESPONSIVITY (UP TO AND BEYOND 10(5) Hz) OF THE CONDUCTUS MICROBOLOMETER, COMBINED WITH ITS RADIATION AND LASER HARDNESS, MAKE IT AN IDEAL CANDIDATE FOR INFRARED DETECTION AND IMAGING SYSTEMS. IT ALSO HAS POSSIBLE COMMERCIAL APPLICATION AS A REPLACEMENT FOR LIQUID He COOLED BOLOMETERS AND PYROELECTRIC DETECTORS CURRENTLY USED IN INFRARED SPECTROPHOTOMETERS. CONDUCTUS PROPOSES UNDER THIS SBIR TO FURTHER OPTIMIZE THE MICROBOLOMETER DESIGN TO IMPROVE PERFORMANCE AND HARDNESS, AND TO FABRICATE AND TEST SEVERAL PROTOTYPES.

SSG INC
150 BEAR HILL RD
WALTHAM, MA 02154
Program Manager: MICHAEL I ANAPOL
Contract #:
Title: SiC LIGHTWEIGHT TELESCOPE AN EMERGING TECHNOLOGY
Topic #: A90-205 Office: SDC ID #: 39657

SiC IS EMERGING AS A SERIOUS ALTERNATIVE TO BERYLLIUM FOR SPACEBORNE, LIGHTWEIGHT TELESCOPE APPLICATIONS DUE TO THE INHERENT MATERIAL PROPERTIES AND RECENT FABRICATION AND REPLICATION PROCESSING ADVANCES. SiC OFFERS THE STIFFNESS AND WEIGHT ADVANTAGES OF BERYLLIUM AND THERMAL PROPERTIES COMPARABLE TO LOW EXPANSION GLASSES, BUT AT COST PROJECTED SUBSTANTIALLY LESS THAN BERYLLIUM. TO DATE, LIMITED EFFORTS HAVE BEEN EXPANDED TO UTILIZE THE RECENT SiC MATERIAL ADVANCES IN A TELESCOPE ASSEMBLY INCLUDING MIRRORS, STRUCTURE, AND MOUNTS. THE CORE INNOVATION PROPOSED IS THE DEVELOPMENT OF A LIGHTWEIGHT SiC BASED TELESCOPE IN A "FLYABLE" CONFIGURATION BASED ON A SPACEBORNE APPLICATION (I.E., ASAT, ERIS, GBI, HEDI, OR SCALED GSTS) AND TESTED FOR THERMAL/CRYOGENIC PERFORMANCE AND STABILITY, STRAYLIGHT REJECTION, ENVIRONMENTAL LOADS AND POSSIBLE NUCLEAR EXPOSURE. PHASE I WILL INCLUDE A CONCEPTUAL DESIGN OF THE LIGHT- WEIGHT TELESCOPE AND THE FABRICATION AND CRYOGENIC TEST OF A REPRESENTATIVE SiC MIRROR (NOMINALLY 4 INCHES). CVD INC. IS SUPPLYING THE -SiC SUBSTRATE AT NOT COST TO THE PROGRAM. SSG WILL FIGURE AND POLISH THE MIRROR AND PERFORM CRYO TESTING AT AN EXISTING FACILITY. PHASE II WILL BE THE DETAIL DESIGN, FABRICATION,

AND TELESCOPE LEVEL TESTING.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
Program Manager: C F HUANG
Contract #:
Title: TWO-COLOR DETECTORS FOR SPACE-BASED INTERCEPTORS
Topic #: A90-206 Office: SDC ID #: 39658

THE RECENT ADVANCES IN BANDGAP ENGINEERING BY MOLECULAR BEAM EPITAXY (MBE) HAVE PRODUCED A STRAINED SUPERLATTICE (SSL) OF InSb/InAsSb CAPABLE OF BEING MADE INTO PHOTODIODES TAILORABLE TO ANY SPECTRAL REPONSE WITHIN THE INFRARED SPECTRUM (1-16 MICRON). TO EXPLOIT THESE ADVANCES, THIS PROPOSAL IS MADE TO DEVELOP A MULTILAYERED STRUCTURE OF InSb/InAsSb THAT WILL RESPONSE TO TWO SPECTRAL BANDS SEPARATELY BUT SIMULTANEOUSLY. THIS INNOVATIVE DETECTOR, SO-CALLED TWO-COLOR DETECTOR, WILL FILL A NEED IN STRATEGIC DEFENSE SYSTEMS, SUCH AS SPACE-BASED INTERCEPTOR, TO PERFORM DISCRIMINATION OF TARGET AGAINST CLUTTER, PLUME AGAINST BOOSTER BODY, TARGET AGAINST DECOY AND RE-ENTRY VEHICLE (RV) AGAINST CLUTTER. THIS NEED CANNOT BE EASILY SATISFIED BY CONVENTIONAL DETECTOR TECHNOLOGY. THIS EFFORT IS TO DEVELOP A MULTILAYERED STRUCTURE OF InSb/InAsSb THAT WILL RESPOND TO TWO SEPARATE SPECTRAL BANDS SIMULTANEOUSLY. THIS STRUCTURE CONSISTS OF TWO SEPARATE DETECTORS, CONFIGURED INTIMATELY ONE ATOP THE OTHER. ONE DETECTOR WILL RESPOND TO THE MEDIUM WAVELENGTH INFRARED (MWIR, 3-5 MICRON) BAND AND ANOTHER TO THE LONG WAVELENGTH INFRARED (LWIR, 8-16 MICRON) BAND. THE RESEARCH WILL USE THE MBE TECHNIQUE TO FORM A NEAR-PERFECT LATTICE MATCHING BETWEEN THE MULTILAYERS AND TO PERFORM IN-SITU DOPING FOR FABRICATING THE PHOTOVOLTAIC JUNCTIONS FOR THE DETECTORS. SPECIAL EFFUSION SOURCES, EPITAXIAL PROCESSES AND DEMONSTRATION OF EPITAXY WILL BE DESIGNED, DELINEATED AND MADE, RESPECTIVELY, IN PHASE I TOWARD THE DEVELOPMENT OF THE TWO-COLOR DETECTOR. PHASE II WILL BE DEVOTED TO OPTIMIZING THE TWO-COLOR DETECTOR, AND PHASE III WILL EXTEND THIS TECHNOLOGY TO DEMONSTRATE A PROTOTYPE ARRAY OF THE TWO-COLOR DETECTORS.

REFRACTORY COMPOSITES INC
12220-A RIVERA RD
WHITTIER, CA 90606
Program Manager: E L TED PAQUETTE
Contract #:
Title: ADVANCED SOLIDS DIVERT PROPULSION TECHNOLOGY
Topic #: A90-206 Office: SDC ID #: 39659

REFRACTORY COMPOSITES, INC. PROPOSES TO UTILIZE CHEMICAL VAPOR INFILTRATION TECHNOLOGY TO PRODUCE GRAPHITE REINFORCED HAFNIUM CARBIDE COMPOSITE NOZZLES FOR EVALUATION AS AN IMPROVED MATERIAL OVER CARBON/CARBON IN LEAP DIVERT SYSTEMS. A DIVERT NOZZLE WILL BE TESTED BY THIOKOL, ELKTON AT CONDITIONS WHICH ERODE c/c NOZZLES IN ORDER TO ESTABLISH THE COMPARATIVE EROSION PERFORMANCE OF c/HfC. THIS TEST WILL CONFIRM THE VIABILITY OF THIS ADVANCED MATERIAL CONCEPT INA HIGH PRESSURE, EROSIVE ENVIRONMENT, BEYOND ITS PREVIOUSLY DEMONSTRATED ULTRAHIGH TEMPERATURE, LOW RECESSION, AEROTHERMAL STABILITY.

INTERNATIONAL TECH TRAN INC
3 ROCKY-GLENN WY
LEBANON, NJ 08833
Program Manager: YOEL CHAH
Contract #:
Title: HYDROSTATIC EXTRUSION OF ALUMINUM-LITHIUM ALLOYS
Topic #: A90-207 Office: BELVOIR ID #: 41831

HYDROSTATIC EXTRUSION IS AN ADVANCED HIGH TECHNOLOGY FOR METAL WORKING AND IS IDEALLY SUITED FOR DIFFICULT-TO-FORM MATERIALS, SUCH AS Al-Li ALLOYS. IT EMPLOYS HIGH FLUID PRESSURE TO EXTRUDE A BILLET THROUGH A DIE, TAKING ADVANTAGE OF THE PRESSURE INDUCED INCREASE OF DUCTILITY OF THE BILLET MATERIAL, AND OF HYDRODYNAMIC LUBRICATION THAT EXISTS BETWEEN THE BILLET AND THE DIE WALLS DURING EXTRUSION. INTERNATIONAL TECH TRAN, INC. IS A LEADER IN THE DEVELOPMENT AND APPLICATION OF HYDROSTATIC EXTRUSION TECHNOLOGY. WE PROPOSE TO APPLY TECHNIQUES USED FOR EXTRUDING OTHER METALS TO Al-Li ALLOYS. THE PRIMARY OBJECTIVE OF THE PROPOSED RESEARCH STUDIES IS TO EVALUATE THE FEASIBILITY OF EMPLOYING HYDROSTATIC EXTRUSION TECHNOLOGY TO Al-Li ALLOYS AT ROOM TEMPERATURE. THIS WILL BE ACCOMPLISHED BY ACTUALLY CARRYING OUT LABORATORY TESTING FOR HYDROSTATIC EXTRUSION OF Al-Li ALLOYS THROUGH VARIOUS DIES IN THE FORM OF SOLID CYLINDERS, THIN-WALLED TUBES, AND MULTI-HOLLOW PLATES. THE SECONDARY OBJECTIVE IS TO GENERATE EXPERIMENTAL DATA, SUCH AS EXTRUSION PRESSURE AS A FUNCTION OF EXTRUSION RATIO, EXTRUSION VELOCITY, EXTRUSION STABILITY OR DIMENSIONAL STABILITY OF EXTRUDATES, THE EXTENT OF PLASTIC DEFORMATION, AND THE SURFACE FINISH. THE FINAL OBJECTIVE IS TO DETERMINE OPTIMUM CONDITIONS FOR EXTRUSION OF Al-Li ALLOYS AND THE BEST CONFIGURATION OF DIES AND MANDRILS.

ABARIS
125 CATRON DR
RENO, NV 89512
Program Manager: WILLIAM L MURPHY
Contract #:
Title: DESIGN AND DEVELOPMENT OF ADHESIVELY BONDED JOINTS
Topic #: A90-208 Office: BELVOIR ID #: 41832

THE U.S. ARMY HAS A NEED FOR A LIGHTWEIGHT, STRONG, MOBILE BRIDGE. ONE PROBLEM THAT LIMITS THE PERFORMANCE IS THE DESIGN OF ADHESIVE JOINTS. THIS PROJECT IS TO DEVELOP SEVERAL OPTIMUM JOINT DESIGNS SO THAT THE LOADS ON JOINTS OF EITHER TUBULAR AND FLAT COMPONENTS ARE IN SHEAR, AND THE STRESS CONCENTRATIONS ARE REDUCED. THE PROPOSED PROGRAM IS TO USE THE RESEARCH WE HAVE ACCOMPLISHED IN EXPERT SYSTEMS FOR OPTIMUM COMPOSITE JOINT DESIGN, AND AN FEA PROGRAM, TO DEVELOP INNOVATIVE JOINT DESIGNS THAT FULFILL THE ARMY'S NEEDS. THE RESULTS WILL BE AN UNDERSTANDING OF THE DETAILS OF THE PRESENT DESIGNS, CANDIDATE JOINT DESIGNS, AND A MODEL OF THE FLAT STRUCTURE ON NISA II AS A BASIS FOR FURTHER DESIGNS. A PHASE II EFFORT WOULD COMPLETE BUILDING ANALYTICAL TOOLS, AND CONDUCT ADDITIONAL DESIGN STUDIES. A PROTOTYPE COULD BE FABRICATED AND STRUCTURALLY TESTED.

GRAHAM RESEARCH CORP
2137 GALLOWAY RD
BENSALEM, PA 19020
Program Manager: DR WILLIAM J GRAHAM
Contract #:
Title: FOCUSED RECTANGULAR SYNTHETIC ARRAY FOR MICROWAVE DETECTION AND IMAGING OF MINES
Topic #: A90-209 Office: BELVOIR ID #: 41905

THIS PROPOSAL IS ADDRESSED TO THE TECHNICAL PROBLEM OF DETECTING AND IMAGING SUBSURFACE ANTI-TANK MINES OF EITHER DIELECTRIC OR METALLIC COMPOSITION USING MICROWAVE RADIATION. THE INNOVATIVE IDEA PROPOSED IS THE USE OF A DIGITAL FOCUSED AND SCANNED MICROWAVE ARRAY RADAR DETECTION SYSTEM. THE SYSTEM USES BISTATIC OBLIQUE FORWARD SCATTERING TO FORM A HIGH RESOLUTION THREE-DIMENSIONAL IMAGE OF THE MEDIUM THAT ALLOWS A MINE TO BE DETECTED AND IDENTIFIED. THE TECHNIQUE HAS THE POTENTIAL TO PROVIDE A UNIQUE METHOD OF HIGH SPEED, HIGH RESOLUTION MINE DETECTION AND IDENTIFICATION. THE PROPOSED METHOD USES A FOCUSED RECTANGULAR SYNTHETIC ARRAY AS A RECEIVER. THE SYNTHETIC ARRAY IS FORMED BY THE FORWARD MOTION OF A HORIZONTAL LINE ARRAY. THE FREQUENCY AND DIMENSIONS OF THE SYSTEM ARE CHOSEN FOR HIGH RESOLUTION, WHILE FORWARD SCATTERING AT THE BREWSTER ANGLE WILL REDUCE GROUND REFLECTIONS TO ZERO. HIGH DEPTH RESOLUTION IS OBTAINED FROM THE DEPTH OF FIELD OF THE ARRAY FOCUS.

TROWER W P INC
1105 HIGHLAND CIR
BLACKSBURG, VA 24060
Program Manager: W PETER TROWER
Contract #:
Title: APPLICATION OF THE NITROGEN CAMERA TO PLASTIC LAND MINE DETECTION
Topic #: A90-209 Office: BELVOIR ID #: 41833

WE DESCRIBED THE NITROGEN CAMERA, A TECHNOLOGY THAT CAN BE EMPLOYED TO IMAGE NITROGEN-RICH LAND MINES. WE WILL VERIFY THE PHYSICS OF THE METHOD USING AN ELECTRON ACCELERATOR OF APPROPRIATE ENERGY AT THE ROYAL INSTITUTE OF TECHNOLOGY (SWEDEN). HERE WE PROPOSE TO DEMONSTRATE IMAGING OF BURIED NITROGEN-RICH OBJECTS IN ACCELERATOR TESTS, TESTING OF AN OPERATIONAL PARTIAL-DETECTOR SYSTEM.

G S ENGINEERING & MACHINE
2817 E FOOTHILL BLVD
PASADENA, CA 91107
Program Manager: GREGORY S STEVENSON
Contract #:
Title: KEROSENE BASE FUELS IN SMALL GASOLINE ENGINES
Topic #: A90-210 Office: BELVOIR ID #: 41906

THIS PROPOSAL OUTLINES AN SBIR PHASE I PROJECT TO DEVELOP A METHOD TO CONVERT SMALL HIGH PERFORMANCE GASOLINE ENGINES TO KEROSENE BASE FUELS. ALMOST ALL OF THE SMALLER RATED GENERATOR SETS WHICH THE ARMY USES ARE GASOLINE DRIVEN. THE CONVERSION METHOD IS TO BE COST EFFECTIVE, COMMERCIALLY AVAILABLE AND OF HIGH SPECIFIC PERFORMANCE. THIS PROPOSAL PROVIDES A SOLUTION TO REACH THESE OBJECTIVES WHILE MAINTAINING EFFECTIVE ENGINE LIFE AND UTILIZATION OF EXISTING STRUCTURE. BECAUSE OF THE HIGH CYLINDER PRESSURES REQUIRED FOR DIESEL IGNITION, DIVIDED CHAMBER CONCEPTS ARE EXPLORED. DIFFICULTIES CONNECTED WITH PROVIDING SMALL FUEL PUMP INJECTORS DICTATED THEIR ELIMINATION FOR SMALL ENGINES. THE COST BECOMES INCREASINGLY DISPROPORTIONATE AND PROHIBITIVE. THEREFORE, THE PROPOSAL ALSO EXPLORES PUMPLESS FUEL INJECTION. THE USE OF EXISTING TECHNOLOGIES WITH INNOVATIVE APPROACHES LEAD TO THE SIMPLICITY OF THE PROPOSED SOLUTION.

SONEX RESEARCH INC
23 HUDSON ST
ANNAPOLIS, MD 21401
Program Manager: MERVYN JOHNSTON
Contract #:

Title: KEROSENE BASE FUELS IN SMALL GASOLINE ENGINES
Topic #: A90-210 Office: BELVOIR ID #: 41907

THE OBJECTIVE OF THE PROJECT'S PHASE I AND PHASE II EFFORTS IS TO DEVELOP AND DEMONSTRATE THE TECHNOLOGY FOR CONVERTING SMALL, INEXPENSIVE, COMMERCIALLY AVAILABLE GASOLINE FUELED ENGINES TO BURN KEROSENE TYPE FUELS. THIS WILL LOWER THE INITIAL COST OF GENERATOR SETS AND WILL ENABLE A SINGLE FUEL TO BE USED ON THE BATTLEFIELD. THE PHASE I OBJECTIVE IS TO DETERMINE: 1. WHICH TYPE OF ENGINE SHOULD BE USED. 2. WHICH COMMERCIAL ENGINES ARE MOST APPROPRIATE. 3. WHAT MODIFICATIONS ARE REQUIRED. MUCH OF THE ABOVE WORK WILL BE DEVELOPED FROM EXISTING SONEX RESEARCH TECHNOLOGY AND EXPERIENCE SUCH AS: 1. DEVELOPMENT OF A DIESEL FUELED 1.5 Kw GENERATOR SET FROM GRUMMAN AEROSPACE. 2. APPLICATION OF MANY OF THE SONEX PATENTS FOR IMPROVED COMBUSTION.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
Program Manager: DR MARY BETH TABACCO
Contract #:
Title: ELECTROCHROMIC THIN FILMS FOR SCATTERING ELECTROMAGNETIC FIELDS
Topic #: A90-211 Office: BELVOIR ID #: 41908

A NEED PRESENTLY EXISTS WITHIN THE U.S. ARMY TO DEVELOP A CAMOUFLAGE SYSTEM WHICH BETTER MATCHES TARGETS TO BACKGROUND TERRAIN. GEO- CENTERS, INC. PROPOSES A MULTIPHASE PROGRAM TO DEVELOP ELECTROCHROMIC TECHNOLOGY TO MEET THIS REQUIREMENT. THE OBJECTIVE OF THE PHASE I PROGRAM IS TO IDENTIFY AND QUANTIFY ELECTROCHROMIC MATERIALS PARAMETERS WHICH CAN BE MODIFIED AND TAILORED FOR CAMOUFLAGE APPLICATIONS. SMALL PROTOTYPE DEVICES WILL BE FABRICATED TO DEMONSTRATE CONCEPT FEASIBILITY. COST ANALYSIS WILL ALSO BE PERFORMED. USING THIS APPROACH, GEO-CENTERS, INC. IN COLLABORATION WITH TUFTS UNIVERSITY, HAS BEEN RESEARCHING AND DESIGNING ELECTRO- CHROMIC THIN FILM DEVICES TO DEVELOP "SMART WINDOWS" WHOSE OPTICAL PROPERTIES CHANGE WITH THE APPLICATION OF A SMALL ELECTRIC CURRENT. IN PHASE II, SCALED UP PANELS (>1 SQUARE FOOT) WILL BE FABRICATED AND THEIR EFFICIENCY WILL BE DETERMINED IN TERMS OF DEGREE OF MODULATION AND POWER CONSUMPTION. ELECTROCHROMIC SCREENS SUITABLE FOR SMALL SCALE PHASE III PRODUCTION WILL BE RECOMMENDED.

TAYLOR S R & ASSOCS
516 SW KAW
BARTLESVILLE, OK 74003
Program Manager: DR SCOTT R TAYLOR
Contract #:
Title: SINCATALYTIC WET OXIDATION FOR BULK WATER PURIFICATION
Topic #: A90-212 Office: BELVOIR ID #: 41910

CURRENTLY, THE ARMY USES WATER PURIFICATION SYSTEMS BASED ON REVERSE OSMOSIS (RO). RO IS EFFECTIVE, BUT CONSIDERABLE ENERGY IS REQUIRED TO OVERCOME THE OSMOTIC PRESSURE OF RAW WATER. ALSO, ELABORATE PRETREATMENT SYSTEMS MUST BE USED TO PROLONG THE LIFE OF EXPENSIVE RO ELEMENTS. THE ARMY DESIRES A SYSTEM THAT IS AT LEAST AS EFFECTIVE AS RO FOR WATER PURIFICATION, YET IS SMALLER, LIGHTER, MORE ECONOMICAL, AND LONGER-LIVED THAN THE CURRENT SYSTEMS. SUCH WATER PURIFICATION MUST BE ABLE TO TREAT A WIDE RANGE OF INCOMING WATERS INCLUDING BUT NOT LIMITED TO SEAWATER DESALINATION, RAW WATERS AND NUCLEAR, BIOLOGICAL AND CHEMICAL CONTAMINATED WATERS. WET OXIDATION OFFERS ADVANTAGES OVER RO, ONE OF THE MOST WIDELY USED ALTERNATIVES FOR WATER PURIFICATION, IN THAT THE BASIC REAGENT, AIR (OXYGEN), IS FREE AND READILY AVAILABLE AND THE SYSTEM DOES NOT HAVE FOULING PROBLEMS TYPICALLY ASSOCIATED WITH RO. THE PROPOSED PROGRAM IS DIRECTED TOWARD DEVELOPMENT OF A

SUITABLE ULTRASONIC REACTOR DESIGN THAT WILL ALLOW RAPID OXIDATION OF CONTAMINANT SPECIES UNDER MILD CONDITIONS THUS REDUCING THE CAPITAL COST FOR THE EQUIPMENT AS WELL AS THE OPERATING COSTS ASSOCIATED WITH THE HIGH TEMPERATURE AND PRESSURE OPERATIONS. S. R. TAYLOR AND ASSOCIATES HAVE BEEN ACTIVELY DEVELOPING APPLICATIONS OF ULTRASONICS TO CHEMICAL AND MATERIAL PROCESSING PROBLEMS AND HAVE RECENTLY BEGUN DEVELOPMENT OF A NOVEL ULTRASONIC REACTOR THAT PROMOTES BULK MIXING VIA AN ULTRASONICALLY INDUCED HIGH SHEAR MECHANISM IN ADDITION TO NORMAL CAVITATION FORCES. WE PROPOSE THAT THIS DUAL ACTION REACTOR CAN DRAMATICALLY REDUCE THE OVERALL PROCESS TEMPERATURE AND PRESSURE REQUIREMENTS FOR WET OXIDATION.

TECHNOLOGY INTERNATIONAL INC
429 W AIRLINE HWY - STE S
LaPLACE, LA 70068
Program Manager: DR ABDO A HUSSEINY
Contract #:
Title: ION EXCHANGE (IX) UNITES AND FREEZING BY EUTECTIC BULK INDIRECT CRYSTALLIZATION (FEUBIC) PROTOTYPE DEVELOPMENT AND TESTING
Topic #: A90-212 Office: BELVOIR ID #: 41909

AS AN ALTERNATIVE TO THE CURRENT ARMY RO WATER PURIFICATION SYSTEM A FREEZING BY EUTECTIC BULK INDIRECT CRYSTALLIZATION (FEUBIC) TECHNIQUE FOLLOWED BY ION EXCHANGE (IX) IS PROPOSED AS PART OF BULK RAW WATER PURIFICATION (BURAWP) SYSTEM FOR SEAWATER DESALINATION, AND REMOVAL OF NUCLEAR, BIOLOGICAL AND CHEMICAL CONTAMINANTS. THE FREEZING PROCESS REQUIRES NO PRETREATMENT AND INSENSITIVE TO THE FEED, LOW CORROSION/FOULING, HAS LOWER ENERGY CONSUMPTION, AND IS LESS COSTLY THAN RO. THE PROPOSED UNIT CAN BE BUILT TO ACHIEVE LONGER-LIFE AND IS SMALLER AND LIGHTER THAN THE CURRENT SYSTEM WITH SIMILAR CAPACITY.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
Program Manager: ROBERT H GIZA
Contract #:
Title: AN INTERACTIVE COMPUTER PROGRAM FOR DECEPTION AND CAMOUFLAGE EVALUATION
Topic #: A90-213 Office: BELVOIR ID #: 41911

AMHERST SYSTEMS PROPOSES TO DEVELOP AN EXPANDABLE AND RECONFIGURABLE SOFTWARE FRAMEWORK FOR TARGET VISUALIZATION WHICH WILL IMPROVE THE DESIGN AND EVALUATION OF CAMOUFLAGE MEASURES AND DECOYS. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO PROVIDE THE ARMY WITH AN INTERACTIVE TOOL FOR THE SUBJECTIVE EVALUATION OF CAMOUFLAGE AND DECEPTION METHODS, AND FOR THE QUANTITATIVE MEASURE OF CAMOUFLAGE EFFECTIVENESS TO BE USED IN DETECTION AND VULNERABILITY ANALYSIS. TO ACHIEVE THIS, COMPUTER GENERATED TARGET IMAGES WILL BE MERGED WITH MEASURED BACKGROUND IMAGERY. THE COLORS AND PATTERNS APPLIED TO THE TARGET WILL BE SPECIFIED AND ALTERED THROUGH A USER-FRIENDLY INTERFACE FEATURING PULL-DOWN MENUS AND CONTEXT SENSITIVE ASSISTANCE.

CREATIVE OPTICS INC
ONE DeANGELO DR
BEDFORD, MA 01730
Program Manager: JAMES C KILIAN
Contract #:
Title: VISUALIZATION SYSTEM FOR CAMOUFLAGE AND DECEPTION DEVELOPMENT AND EVALUATION

Topic #: A90-213 Office: BELVOIR ID #: 41912

CREATIVE OPTICS, INC. IS PROPOSING AN ADVANCED SYSTEM FOR DESIGNING CAMOUFLAGE AND DECEPTION AND FOR EVALUATING THE RESULTING TARGET ACQUISITION REDUCTION. IN PHASE I, INTERACTIVE TECHNIQUES FOR TARGET IMAGE SCALING, TARGET/BOUNDARY BACKGROUND CORRECTION, TARGET INSERTION, AND TARGET COLOR AND TEXTURE MANIPULATION WILL BE IMPLEMENTED AND DEMONSTRATED TO BELVOIR RD&E CENTER. FURTHERMORE, A DEMONSTRATION OF THE DESIGN AND EVALUATION SYSTEM CONCEPT THAT LINKS PREVIOUS CREATIVE OPTICS, INC. WORK IN CAMOUFLAGE EVALUATION AND FIELD TEST DATABASE TECHNOLOGIES WILL BE MADE. OUR PROPOSED SYSTEM WILL RESULT IN RAPID TURN AROUND TIME BETWEEN DESIGN AND EVALUATION STAGES, ENRICHMENT OF ARCHIVED FIELD TEST DATA, AND LOW COST RELATIVE TO FIELD TESTS.

AGILIS CORP
8945 GUILFORD RD - STE 125
COLUMBIA, MD 21046
Program Manager: WILLIAM C TAYLOR
Contract #:
Title: MODULAR SOLDIER'S COMPUTER (MSC)
Topic #: A90-214 Office: CECOM ID #: 41956

AGILIS CORPORATION PROPOSES TO DEVELOP THE SYSTEM CONCEPT FOR A MODULAR SOLDIER'S COMPUTER. THIS EFFORT IS A DIRECT EXTENSION OF AGILIS' ONGOING WORK WITH COMMERCIAL CLIENTS TO DEVELOP SIMILAR CAPABILITIES. THE MODULAR SOLIDER'S COMPUTER MUST BE VERY SMALL (POCKET-SIZED), LIGHT WEIGHT (1 TO 2 POUNDS), RUGGED, POWERFUL, NETWORKED, AND HAVE AN ADVANCED USER INTERFACE. MILITARY APPLICATIONS INCLUDE BATTLEFIELD STATUS, MESSAGE PROCESSING, MAINTENANCE AIDING AND TRAINING, AND FIRE CONTROL. AGILIS WILL REVIEW THE REQUIREMENTS FOR A MODULAR SOLDIER'S COMPUTER, CONDUCT A DETAILED TECHNOLOGY SURVEY, AND DEVELOP A CONCEPTUAL APPROACH FOR IMPLEMENTING THE SYSTEM. THE RESULT WILL BE A FINAL TECHNICAL REPORT, AND A PROPOSAL TO IMPLEMENT A PROTOTYPE SYSTEM IN A PHASE II SBIR AWARD.

ENSCO INC
5400 PORT ROYAL RD
SPRINGFIELD, VA 22151
Program Manager: DR THOMAS GAMBLE
Contract #:
Title: NEURAL NETWORK-BASED CLASSIFICATION OF VEHICLES FROM LASER RADAR DATA
Topic #: A90-215 Office: CECOM ID #: 41975

HIGHLY RELIABLE VEHICLE CLASSIFICATION VIA COHERENT RADAR VIBRATION DATA HAS BEEN DEMONSTRATED USING PARAMETRIC CLASSIFIER TECHNIQUES. HOWEVER, PARAMETRIC CLASSIFIER DEVELOPMENT REQUIRES EXTENSIVE, EXPERT HUMAN DIRECTION. IT BECOMES IMPRACTICAL WHEN THE CLASSES ARE COMPLEX, AS WHEN THERE ARE MANY OPERATIONAL AND ENVIRONMENTAL CONDITIONS AND WHEN THE NUMBER OF CLASSES IS LARGE. NEURAL NET FORMULATIONS, PARTIULARLY FEEDFORWARD NETWORKS, HAVE SHOWN MUCH PROMISE IN CHARACTERIZING COMPLEX CLASSES. HOWEVER, THE OPTIMUM NUMBER OF NODES CAN BE DETERMINED ONLY BY TRIAL AND ERROR. TRAINING SUCH NETWORKS BY ITERATIVE METHODS CAN BE PROHIBITIVELY EXPENSIVE. INTERPRETING THE FEATURES DISCOVERED BY A NETWORK CAN BE HIGHLY PROBLEMATICAL. WE DESCRIBE A DIRECT METHOD NET CONSTRUCTION, BASED ON POTENTIAL FUNCTION CLASSIFIER THEORY, WHICH IS MORE GENERAL THAN ANY NOW IN USE. GREAT SUPERIORITY IN EFFICIENCY AND ACCURACY OVER NEAREST NEIGHBOR CLASSIFICATION IS DEMONSTRATED IN TESTS ON SYNTHETIC DATA. WE PROPOSE TO CONSTRUCT SUCH A NETWORK AND EVALUATE ITS PERFORMANCE ON A DATA SET WHICH HAS BEEN USED TO CONSTRUCT AND TEST A PARAMETRIC CLASSIFIER. AN ENCODING OF THE SPECTRAL DATA AS

FEATURES APPROPRIATE FOR INPUT TO THE NET IS DISCUSSED. THESE FEATURES SHOULD EXTRACT ALL OF THE SIGNIFICANT SPECTRAL INFORMATION AND MAINTAIN A STABLE CONFIGURATION IN THE PRESENCE OF NOISE.

ATLANTIC AEROSPACE ELECTRONICS CORP
470 TOTTEN POND RD
WALTHAM, MA 02154
Program Manager: SVEN SPOERRI
Contract #:
Title: IMPROVING SUB-CLUTTER VISIBILITY FOR THE DETECTION AND CLASSIFICATION OF TARGETS IN HIGH CLUTTER ENVIRONMENTS
Topic #: A90-216 Office: CECOM ID #: 41979

THIS PROPOSAL DESCRIBES A NOVEL APPROACH TO IMPROVING PERFORMANCE OF MTI RADARS FOR THE DETECTION AND CLASSIFICATION OF MODERN, LOW OBSERVABLE TARGETS IN RELATIVELY HIGH CLUTTER ENVIRONMENTS. AN IMPORTANT PART OF THIS APPROACH IS ATLANTIC AEROSPACE ELECTRONICS CORP'S. APPLICATION OF MORPHOLOGICAL PROCESSING TECHNIQUES TO RADAR DETECTION, TRACKING AND FEATURE EXTRACTION FOR CLASSIFICATION. THESE TECHNIQUES OFFER IMPROVED PERFORMANCE AGAINST NONUNIFORM CLUTTER BACKGROUNDS AND HIGH FALSE ALARMS RESULTING FROM USE OF LOWERED THRESHOLDS FOR DETECTION OF REDUCED-RADAR-CROSS SECTION TARGETS. IN ADDITION, THEY ARE COMPUTATIONALLY SIMPLE AND THUS CAN HANDLE LARGE AMOUNTS OF DATA AT REAL-TIME RATES IN COMPACT PROCESSOR HARDWARE IMPLEMENTATIONS. THIS IS IMPORTANT TO THE PROBLEM AT HAND SINCE THE CAPABILITIES OF CURRENT STATE-OF-THE-ART RADAR SYSTEM COMPONENTS WILL BE EXAMINED AND TRADES MADE TO CHOOSE RADAR PARAMETERS THAT OPTIMIZE PERFORMANCE. IN PARTICULAR, A HYBRID ANALOG/DIGITAL CLUTTER CANCELLATION SCHEME WILL BE EVALUATED WHICH *OFFERS THE POTENTIAL TO REDUCE THE A/D CONVERTER DYNAMIC RANGE REQUIREMENT* ALLOWING USE OF FASTER SAMPLING FOR BETTER RADAR RANGE RESOLUTION AND REDUCE CLUTTER. WHILE THIS WILL REDUCE THE SUBCLUTTER VISIBILITY REQUIREMENT ON THE MTI PROCESSING, IT CAN SUBSTANTIALLY INCREASE THE PROCESSING COMPUTATIONAL LOAD.

SPARTA INC
23041 AVENIDA DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
Program Manager: DOUG PRICE
Contract #:
Title: COMPUTER VIRUS ELECTRONIC COUNTERMEASURES (ECM)
Topic #: A90-217 Office: CECOM ID #: 41969

C(3)CM WAS CONCEIVED AS AN APPROACH FOR ATTACKING MILITARY COMMAND & CONTROL SYSTEMS. IT IS DEFINED AS "AN INTEGRATED PROCESS WHICH USES OPSEC, MILITARY DECEPTION, JAMMING, AND PHYSICAL DESTRUCTION, SUPPORTED BY INTELLIGENCE, TO DENY INFORMATION, INFLUENCE, DEGRADE, OR *DESTROY ADVERSARY C(3) CAPABILITIES. IN AN ADP NETWORK CONTEXT, WE CAN DERIVE AN* ANALOGOUS APPROACH FOR ATTACKING NETWORKED ADP SYSTEMS. FOR FIVE YEARS, SPARTA HAS BEEN INVESTIGATING THE USE OF C3(CM) AS A WAY TO EVALUATE THE SECURITY OF A COMPUTER NETWORK. IN THIS STUDY, WE PROPOSE TO LOOK AT THIS PROBLEM IN THE REVERSE DIRECTION: TO APPLY COMPUTER SECURITY ATTACK METHODS AS A C3(CM) TECHNIQUE DIRECTED AGAINST COMMAND & CONTROL NETWORKS. RECENT EVENTS HAVE DEMONSTRATED THE DESTRUTIVE IMPACT THAT COMPUTER VIRUSES AND OTHER FORMS OF MALICIOUS CODE CAN HAVE ON COMPUTER SYSTEMS. THE QUESTION ARISES AS TO WHETHER COMPUTER VIRUS BASED TECHNIQUES CAN BE USED AS A MEANS FOR ATTACKING A C(2) NETWORK. IN THIS PROPOSED STUDY, SPARTA, INC. WILL EVALUATE THE FEASIBILITY OF USING COMPUTER VIRUSES AS AN EFFECTIVE ECM TECHNIQUE.

UNIXPROS INC
16 BIRCH LN
COLTS NECK, NJ 07722
Program Manager: ARVIND GOEL
Contract #:
Title: ADA/UNIX COMPATIBILITY FOR REAL-TIME APPLICATIONS
Topic #: A90-218 Office: CECOM ID #: 41972

ACHIEVING HIGH PERFORMANCE AND MEETING REAL-TIME REQUIREMENTS ARE AREAS OF MAJOR CONCERN IN IMPLEMENTING REAL-TIME SYSTEMS IN ADA ON TARGETS RUNNING UNIX OPERATING SYSTEM. STANDARD UNIX LACKS REAL-TIME FEATURES THAT CAN ENABLE AN ADA RUNTIME SYSTEM TO BE DESIGNED SO AS TO ACHIEVE HIGH PERFORMANCE SIMILAR TO THAT OF BARE TARGET ADA IMPLEMENTATIONS. USE OF REAL-TIME UNIX FEATURES SUCH AS PREEMPTIVE SCHEDULING, ASYNCHRONOUS I/O, REAL-TIME TIMERS, MINIMUM AND BOUNDED INTERRUPT LATENCIES, ETC.) WILL IMPROVE THE PERFORMANCE AS WELL AS SIMPLIFY IMPLEMENTATION OF MANY AREAS OF AN ADA RUNTIME SYSTEM. THESE AREAS INCLUDE SCHEDULING,.TASKING, INTERRUPTS, MEMORY MANAGEMENT, CHAPTER 13, AND I/O. THIS PROPOSAL ADDRESSES THE METHODS AND TECHNIQUES TO BE USED DURING PHASE I TO IMPLEMENT THE DESIGN OF AN ADA RUNTIME SYSTEM UTILIZING REAL-TIME UNIX/POSIX EXTENSIONS. AN EXISTING ADA RUNTIME SYSTEM IMPLEMENTATION ALONG WITH AN EXISTING REAL-TIME UNIX IMPLEMENTATION WILL BE USED TO DETERMINE THE FEASIBILITY OF THE PROPOSED TECHNIQUES.

TAI INC
12021 S MEMORIAL PKWY - STE P-4
HUNTSVILLE, AL 35803
Program Manager: LOY W SHREVE II
Contract #:
Title: METHOD FOR DETECTING PINHOLES IN HERMETRIC COATINGS OF OPTICAL FIBERS
Topic #: A90-219 Office: CECOM ID #: 41963

DEMONSTRATE A FOURIER (LASER DIFFRACTION) INSPECTION METHOD FOR DETECTING PINHOLES IN HERMETIC COATINGS OF OPTICAL FIBERS. FOURIER METHODS HAVE BEEN SUCCESSFUL IN DETECTION AND COUNTING OBJECTS IN THE SIZE RANGE (0.01 TO 20 MICRONS) OF ANTICIPATED PINHOLE DEFECTS. THIS METHOD IS NON-CONTACTING, NON-DESTRUCTIVE, AND WILL NOT INTERFERE WITH THE OPTICAL FIBER DRAWING PROCESS. FORMULATE A DRAFT SET OF STANDARDS TO EVALUATE EFFECTIVELY OF PINHOLE DETECTION METHODS. COMPARE THIS NEW METHOD TO PRESENT METHODS. WORK UNDERTAKEN SHALL INCLUDE: (i) RESEARCH STATE-OF-THE-ART METHODS. (ii) FORMULATE DRAFT EVALUATION STANDARDS. (iii) PERFORM EXPERIMENTAL DEMONSTRATION (PROOF-OF-PRINCIPLE) OF FOURIER (LASER DIFFRACTION) INSPECTION FOR PINHOLES IN HERMETIC COATINGS VIA AN EXISTING INSTRUMENT DEVELOPED AND MANUFACTURED BY THE PROPOSER, TAI, INC. (iv) CREATE A PLAN TO DEVELOP AND TEST A FULLY FUNCTIONAL PRODUCTION INSPECTION SYSTEM BASED UPON TAI'S INSTRUMENT FOR INSTALLATION AT A MANUFACTURING FACILITY FOR PHASE II. DESCRIBE PLAN TO COMMERCIALIZE THIS SYSTEM ACROSS A BROAD SEGMENT OF OPTICAL FIBER MANUFACTURING. THE TYPE OF SYSTEM WE PROPOSE WILL DETECT PROBLEMS IN-PROCESS ALLOWING NOT ONLY INSPECTION BUT TIMELY CORRECTION OF PROBLEMS. IF HERMETIC COATING APPLICATION, NOW DESIRABLE, BECOMES UNIVERSAL BY BECOMING READILY AND THOROUGHLY VERIFIABLE, THE VALUE OF SYSTEMS MAKING THIS POSSIBLE BECOMES VERY HIGH.

NOVACOM INC
4503 SOUTHGATE PL
CHANTILLY, VA 22021
Program Manager: PILAR M UELMEN
Contract #:

Title: AUTOMATED QUALITY DEFICIENCY REPORT UTILIZING COMMERCIALLY AVAILABLE SMART CARD
Topic #: A90-220 Office: CECOM ID #: 41961

THE CURRENT PROCEDURE FOR REPORTING COMMUNICATIONS ELECTRONICS SYSTEM SOFTWARE FAILURE USING PAPER FORMS IS ERROR-PRONE, TIME-CONSUMING AND INEFFICIENT. WHEN NUMEROUS TROUBLE REPORTS ARE ROUTINELY GENERATED, AS IS THE CASE WITH LARGE SYSTEMS OR SYSTEMS DEPLOYED AT MULTIPLE SITES, THE DEFICIENCIES OF PAPER FORMS MAY SEVERLY INHIBIT THE PROBLEM RESOLUTION PROCESS. THE TIMELY CORRECTION OF FIELD FAILURES IS A CRITICAL COMPONENT OF SYSTEM MAINTENANCE. NOVACOM, INC. WILL STUDY THE FEASIBILITY OF REPLACING THE USE OF PAPER FORMS WITH AN ON-LINE TROUBLE REPORTING SYSTEM, OR QUALITY DEFICIENCY REPORTING SYSTEM, WHICH WOULD STORE THE TROUBLE REPORTS, ALONG WITH A RECORD OF THE C-E SYSTEM CONFIGURATION, ONTO DURABLE, NONVOLATILE SMART CARDS. FAILURE INFORMATION COULD BE ENTERED AT A TERMINAL, TRANSFERRED TO THE SMART CARD AND EITHER UPLOADED OR PHYSICALLY FORWARDED TO THE APPROPRIATE PERSONNEL FOR RESOLUTION. EMPHASIS WILL BE PLACED ON THE FEASIBILITY OF INTEGRATING THE QDRS INTO EXISTING C-E SYSTEM MAINTENANCE EQUIPMENT. THE STUDY SHOULD REVEAL THAT A QDRS WOULD IMPROVE THE SPEED AND ACCURACY OF TROUBLE REPORT ENTRIES AND EXPEDITE RESOLUTION OF SOFTWARE FAILURES.

SEIDCON INC
2171 EL CAMINO REAL
OCEANSIDE, CA 92054
Program Manager: DR ELGIE J McGRATH
Contract #:
Title: EVOLUTIONARY PROGRAMMING APPLIED TO PATTERN RECOGNITION
Topic #: A90-221 Office: CECOM ID #: 41965

THE NATURE OF TACTICAL ARMY WARFARE IS MOVING TOWARD GREATER COMPLEXITY AS THE COMMAND STRUCTURE IS REQUIRED TO DEAL WITH INCREASING AMOUNTS OF INFORMATION IN NEAR REAL TIME THAT MUST BE USED AS A BASIS FOR CRITICAL DECISION MAKING. THE TECHNOLOGY BEING DEVELOPED IN THE ARTIFICIAL INTELLIGENCE COMMUNITY IS SHOWING CONSIDERABLE PROGRESS TO PROVIDE THE TECHNIQUES TO HELP THE BATTLE- FIELD COMMANDER MEET THIS CHALLENGE. PROCESSING AREAS INCLUDE EXPERT SYSTEMS AND NEURAL NETWORKS. PHASE I DEMONSTRATES APPLICATION OF TECHNIQUES DERIVED FROM NATURAL SELECTION AND GENETICS (I.E., THE GENETIC ALGORITHM) TO EVOLVE FINITE STATE MACHINES THAT LEARN TO RECOGNIZE PATTERNS FROM PAST OBSERVATIONS. THE APPROACH WILL UE SIMPLE PATTERNS AND COMPARE RESULTS WITH A NEURAL NETWORK APPROACH. FINITE STATE MACHINES ARE A VERY SIMPLE WAY TO TRANSFORM DIGITAL DATA BY MAPPING THE OBSERVED DATA INTO PREDICTED DATA BY TRANSITIONS BETWEEN A FINITE NUMER OF INTERNAL STATES. THE INTERNAL OPERATION OF THE FINITE STATE MACHINE IS CARRIED OUT IN SUCH A WAY AS TO CHARACTERIZE INFORMATION CONTENT. THEIR SIMPLE STRUCTURE ALONG WITH THE GENETIC ALGORITHM IS AMENABLE TO BEING IMPLEMENTED IN EFFICIENT PARALLEL PROCESSING ARCHITECTURES.

SYSTEMS & PROCESSES ENGR CORP (SPEC)
1406 SMITH RD
AUSTIN, TX 78721
Program Manager: DR NEWTON B PENROSE
Contract #:
Title: SENSOR PLACEMENT SYSTEM (SPS)
Topic #: A90-221 Office: CECOM ID #: 41964

THE ARMY WILL ULTIMATELY EMPLOY TACTIAL IMAGERY/INFORMATION PROCESSING SYSTEM TO ASSIST COMMANDERS BY INTEGRATING THE BATTLEFIELD SITUATION WITH CHANGING TERRAIN AND ENVIRONMENTAL CONDITIONS. TERRAIN REASONING IS A MAJOR FACTOR INVOLVING SENSOR LOCATIONS,

MOBILITY, ROUTE LOCATIONS, CHOKE POINTS, TARGET AREAS OF INTEREST, FIREPOWER RESOURCE ALLOCATION, EVENT DETECTION, FUEL CONSUMPTION, AND LOGISTICAL COORDINATION. A CRITICAL ADJUNCT TO TERRAIN REASONING AND THE BRIGADE INTELLIGENCE FUNCTION IS SENSOR PLACEMENT TO DETECT THREAT FORCE ALONG ANTICIPTED APPROACHES. THIS PROGRAM INTEGRATES ARTIFICIAL INTELLIGENCE TECHNOLOGY WITH THE GRASS GEOGRAPHIC INFORMATION SYSTEM (GIS) TO SUPPORT EXPERT SYSTEM PLACEMENT OF SENSORS (SPS). SPS WILL BE DEVELOPED UNDER THE UNIX SYSTEM V RELEASE 3 OPERATING SYSTEM ENVIRONMENT USING "C" LANGUAGE PRODUCTION SYSTEM (CLIPS) AS THE AI DEVELOPMENT TOOL. SENSORS CONSIDERED ARE MTI RADAR, REMBASS - INFRARED, ACOUSTIC, SEISMIC, & MAGNETIC - AND WAM (WIDE AREA MINES). APPLICATION OF WAM TECHNOLOGY INCLUDES THE REMOTE RECONNAISSANCE PACKAGE (RRP) SENSOR, DARPA C2 MASTER CONTROL UNITS, AND SPEC EXPERT SYSTEM MANAGER. BENEFITS TO THE ARMY ARE (1) BRIGADE BATTLE PLAN FOR SENSOR PLACEMENT, (2) KNOWLEDGE BASED DECISION SUPPORT FOR EFFICIENT USE OF SENSOR ASSETS, AND (3) EXPERT SYSTEM TO PREDICT SENSOR REQUIREMENTS, ALLOCATE ASSETS, EXPLOIT CONSTRAINTS, AND EVALUATE ALTERNATE INTELLIGENCE SUPPORT PLANS.

DCS CORP
1330 BRADDOCK PL
ALEXANDRIA, VA 22314
Program Manager: SAMUEL L SHELLER
Contract #:
Title: DETECTION OF SLOW SPEED TARGETS IN CLUTTER
Topic #: A90-222 Office: CECOM ID #: 41980

DCS PROPOSES TO DEVELOP A SIMULATION AND HARDWARE ARCHITECTURE OF A RADAR RECEIVER TO DETECT MOVING TARGETS THAT OFFERS SIGNIGICANT IMPROVEMENTS OVER EXISTING RECEIVERS. THE UNIQUE RECEIVER/SIMULATION CAN BE UTILIZED IN AIR, SURFACE, AND SPACE ENVIRONMENTS. THE RANGE AND ALL WEATHER CAPABILITIES OF RADAR ENSURES ITS UTILIZATION IN BOTH SINGLE/MULTIPLE MISSION SYSTEMS. MODERN RADARS ARE HIGH RESOLUTION, MULTIFUNCTION, SIMULTANEOUS MODE SYSTEMS. ELECTRONIC PHASED ARRAY ANTENNAS HAVE BEEN DEVELOPED TO CIRCUMVENT THE MECHANICAL NIGHTMARES REQUIRED TO SCAN THE ENVIRONMENT AND SUPPORT DESIRED FEATURES. THE INCREASED FUNCTIONALITY AND FLEXIBILITY OF ELECTRONIC SYSTEMS IS NOT WITHOUT TRADEOFFS. IN ORDER TO IMPLEMENT TIMING REQUIREMENTS, THROUGHPUT REQUIREMENTS, BEAM STEERING, DOPPLER FILTERING, SIGNAL CONDITIONING AND PROCESSING, MULTIPLE TARGET TRACKING, TARGET IMAGING, ETC. INTEGRAL PARTS OF MODERN RADAR SYSTEMS MUST INCLUDE SOPHISTICATED RADAR RECEIVERS. THIS RESEARCH PRESENT A PLAN TO DEVELOP A SIMULATION TO ANALYZE TRADEOFFS AND DEVELOP A RECEIVER DESIGN PLAN BASED ON THE ANALYSES. THE SIMULATION ALSO PERMITS THE EVALUATION OF DOPPLER PROCESSOR APPLIED TO THE SLOW MOVING GROUND TARGETS IN CLUTTER PROBLEM.

INTEGRATED SENSORS INC
255 GENESEE ST
UTICA, NY 13501
Program Manager: CHRIS WILDER
Contract #:
Title: ELECTRONICALLY SCANNED (E-SCAN) ANTENNA TECHNOLOGY FOR A LIGHTWEIGHT BATTLEFIELD SURVEILLANCE RADAR
Topic #: A90-223 Office: CECOM ID #: 41981

THIS PROPOSAL PRESENTS THE PRELIMINARY DESIGN AND ANALYSIS OF A PORTABLE, LOW-POWER, HIGH RELIABILITY BATTLEFIELD SURVEILLANCE RADAR INTENDED TO REPLACE SYSTEMS SUCH AS THE AN/PPS-5 AND AN/PPS-15 SYSTEMS. IT DETAILS THE SYSTEM AND HARDWARE DESIGN TRADEOFFS, AND SHOWS THE RESULTS OF A SYSTEM LEVEL PERFORMANCE ANALYSIS INCLUDING THE MODELLING OF RANDOM AND NON-RANDOM ERRORS. EMPHASIS HAS BEEN PLACED ON DESIGN FOR RELIABILITY AND COST EFFICIENCY.

THE PROPOSED SYSTEM TAKES ADVANTAGE OF A UNIQUE MMIC TIME-DELAY PHASER CHIP TO PROVIDE LOW QUIESCENT POWER OPERATION, AND INCORPORATES MICROWAVE PRINTED CIRCUITS WHICH ELIMINATE MANY OF THE LOW-RELIABILITY COMPONENT INTERCONNECTIONS.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
Program Manager: C F HUANG
Contract #:
Title: FABRICATION OF LONG WAVELENGTH ARRAY BY IN-SITU MOLECULAR BEAM EPITAXY
Topic #: A90-225 Office: CECOM ID #: 41976

BANDGAP ENGINEERING BY MOLECULAR BEAM EPITAXY (MBE) IS NOT ONLY CAPABLE OF PRODUCING A STRAINED SUPERLATTICE (SSL) OF InSb/InAs(1-x)Sb(x) FOR LONGWAVELENGTH INFRARED (LWIR, 8-12 MICRON) DETECTORS, BUT IS ALSO CAPABLE OF PROCESSING THE DETECTORS INTO A MONOLITHIC ARRAY. WE WILL DEVELOP THE MBE PROCESS FIRST TO GROW THE SSL ON A BUFFERED SILICON (Si) SUBSTRATE AND THEN DELINATE THE SSL INTO AN ARRAY OF PHOTODIODES WHICH CAN BE INTERFACED DIRECTLY ONTO A READOUT CIRCUITRY PREVIOUSLY FABRICATED ON THE SAME Si SUBSTRATE. THUS, A MONOLITHIC ARRAY IS FABRICATED IN-SITU DURING A SINGLE EPITAXY PROCESS. THE KEY INNOVATION PROPOSED IS THE COMBINING OF THE SSL EPITAXY, PHOTODIODE FORMATION AND READOUT ELECTRONIC INTERFACING AS A SINGLE PROCESS FOR FABRICATING THE MONOLITHIC ARRAY. WHEN SUCCESSFULLY DEVELOPED, THE PROCESS SHOULD BE HIGH YIELD, LOW COST AND CAPABLE OF PRODUCING HIGH-PERFORMANCE LWIR DETECTOR ARRAYS BY ELIMINATING THE USE OF WET CHEMICAL ETCHING.

NOVA ENGINEERING INC
6300 STONEWALL LN
FAIRFIELD, OH 45014
Program Manager: TERRANCE J HILL
Contract #:
Title: A SINUSOID-FREE SPREAD SPECTRUM COMMUNICATIONS SYSTEM EMPLOYING PURE NOISE AS A CARRIER
Topic #: A90-226 Office: CECOM ID #: 41966

SPREAD SPECTRUM TECHNIQUES ARE WIDELY ACKNOWLEDGED TO PROVIDE LOW PROBABILITY OF INTERCEPT (LPI) CAPABILITY. CONVENTIONAL DIRECT SEQUENCE SPREADING, HOWEVER, SUFFERS FROM THE SHORTCOMING THAT AN INTERCEPTOR REQUIRES ONLY VERY SIMPLE PROCESSING TO COLLASPE THE SPREAD SIGNAL TO A NEADILY DETECTABLE UNMODULATED SIMUSOID. FURTHERMORE, HIGH LEVELS OF LPI ARE ONLY ACHIEVED BY USING HIGH SPEED GENERATORS FOR THE SPREADING SIGNALS, NECESSITATING COMPLEX SYNCHRONIZATION ALGORITHMS. THE APPROACH DESCRIBED HERE ELIMINATES THESE UNDERSIRABLE CHARACTERISTICS BY REPLACING THE SINUSOIDAL CARRIER WITH A PURE NOISE WAVEFORM. THIS PREVENTS AN INTERCEPTOR FROM USING NON-LINEAR TECHNIQUES TO EXPLOIT SOME DETERMINISTIC ELEMENT OF THE SIGNAL BECAUSE THERE ARE NONE TO EXPLOIT. IN ADDITION, SINCE THE SPECTRAL SPREADING IS NOT A FUNCTION OF THE RATE AT WHICH THE TRANSEC GENERATOR IS CLOCKED, VERY SLOWLY CHANGING (OR FIXED) TRANSEC CAN BE USED, THEREBY GREATLY SIMPLIFYING (OR ELIMINATING) THE SYNCHRONIZATION PROCESS. THE OBJECT OF THIS EFFORT IS TO INVESTIGATE THIS BASIC CONCEPT, DETERMINE THE LPI PERFORMANCE ACHIEVED FOR A WIDE RANGE OF DESIGN PARAMETERS, AND DEVELOP A BREADBOARD FOR EVALUATION. THE METHODOLOGY MAKES EXTENSIVE USE OF COMPUTER SIMULATION TO PROVIDE BOTH QUALITATIVE INSIGHT AND A QUANTITATIVE EVALUATION OF THE TECHNIQUE'S PERFORMANCE.

ORINCON CORP

9363 TOWNE CENTRE DR
SAN DIEGO, CA 92121
Program Manager: EUGENE FRAZIER
Contract #:
Title: APPLICATION OF NEURAL NETWORKS TO COMMAND AND CONTROL
Topic #: A90-227 Office: CECOM ID #: 41957

EVOLVING NEURAL NETWORK TECHNOLOGY HAS THE POTENTIAL TO PROVIDE THE RAPID INFORMATION REDUCTION AND ASSESSMENT THAT WILL BE REQUIRED FOR NEW GENERATION COMMAND AND CONTROL SYSTEMS. IN COMPARISON WITH OTHER TYPES OF CLASSIFICATION AND DECISION ALGORITHMS, NEURAL NETWORKS ARE ROBUST AND DEPEND ONLY WEAKLY ON ASSUMPTIONS MADE ABOUT INFORMATION OR NOISE DISTRIBUTIONS. AS A RESULT, THERE IS LESS DIFFICULTY ADAPTING NEURAL NETWORK TECHNOLOGY TO A VARIETY OF INFORMATION SOURCES. IN ADDITION, THIS TYPE OF PROCESSING PROVIDES THE POTENTIAL FOR ADAPTABILITY IN THE FACE OF NEW OR CHANGING THREAT SIGNATURES. RECENT RESULTS IN NEURAL NETWORK RESEARCH HAVE SHOWN THE DESIRABILITY OF FUSING DATA FROM SUCH DIFFERENT SENSORS AS ACOUSTIC AND VISUAL INPUT TO PERFORM SPEECH RECOGNITION. THE ABILITY TO ENCODE FUZZY RELATIONS AND DECISION RULES IN NEURAL NETWORKS CAN OVERCOME THE SPEED LIMITATIONS OF SERIAL DECISION-MAKING AIDS SUCH AS RULE-BASED EXPERT SYSTEMS. THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT IS TO CONVERT THE STATE-OF-THE-ART WORK THAT HAS BEEN COMPLETED IN NEURAL NETWORKS TO SOFTWARE, WHICH CAN BE USED FOR INFORMATION PROCESSING AND DECISION MAKING IN A COMMAND AND CONTROL OPERATING ENVIRONMENT, SUCH AS THE PLANNING AND EXECUTION OF AN AIRBORNE ASSAULT. IN ADDITION, ORINCON WILL PROVIDE AN APPROACH FOR DEVELOPING AND TESTING A PROTOTYPE APPLICATION IN THE FIELD.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
122 N 4TH AVE
INDIALANTIC, FL 32903
Program Manager: DR ANDRES RUDMIK
Contract #:
Title: CLICHE-BASED SOFTWARE COMPONENT SELECTION
Topic #: A90-228 Office: CECOM ID #: 41973

THE OBJECTIVE OF THE PROPOSED PHASE I EFFORT IS TO DEFINE, DEMONSTRATE, AND VALIDATE THE CONCEPT FOR A CLICHE-BASED SOFTWARE COMPONENT SELECTION SYSTEM THAT CAN AUTOMATICALLY SELECT THE BEST POSSIBLE ASSETS FROM A REUSABLE SOFTWARE LIBRARY TO MEET THE DEVELOPERS NEED. THE APPROACH IS BASED UPON A CONCEPT OF CLICHES THAT ARE ABSTRACT, SKELETAL REPRESENTATIONS OF THE SEMANTICS AND STRUCTURE OF SOFTWARE COMPONENTS. DURING THE SOFTWARE DEVELOPMENT PROCESS THE DEVELOPER WILL HAVE THE CAPABILITY TO RETRIEVE REUSABLE ASSETS AND SELECT THOSE BEST-FIT ASETS BASED UPON HIS DEVELOPMENT CONTEXT. THE CLICHE-BASED SOFTWARE COMPONENT SELECTION SYSTEMS WOULD ANALYZE THE DEVELOPER'S NEED, AS REPRESENTED IN THE DEVELOPER'S DESIGN EDITOR, AND COMPARE THAT NEED WITH CLICHE REPRESENTATIONS OF THE CANDIDATE COMPONENTS. PHASE I WILL DEFINE VARIOUS REPRESENTATIONS AND ALGORITHMS TO BE USED FOR BEST-ASSET SELECTION AND DEFINE THE PHASE II SYSTEM ARCHITETURE.

INTEGRATED SOFTWARE INC
PO BOX 060295 - 1945 PALM BAY RD NE/#7
PALM BAY, FL 32906
Program Manager: STEVEN A Von EDWINS
Contract #:
Title: SOFTWARE REUSE TECHNOLOGY AND TOOLS
Topic #: A90-229 Office: CECOM ID #: 41958

ADA SOURCE CODE FOR REAL-TIME SYSTEMS CAN BE PORTED ACROSS HARDWARE ARCHITECTURES BUT

ITS BEHAVIOR CAN BE DIFFICULT TO REPLICATE. THE ADA LANGUAGE REFERENCE MANUAL SPECIFIED THE SEMANTICS OF ADA RUNTIME ENVIRONMENTS BUT LEAVES THE IMPLEMENTATION UP TO THE COMPILER DEVELOPER. THUS THE ULTIMATE BEHAVIOR OF THE RUNTIME ENVIRONMENT IS IMPLEMENTION SPECIFIC. THIS IS A SIGNIFICANT BARRIER TO OVERCOME WHEN REUSING SOFTWARE AND PORTING SOFTWARE FROM ONE HARDWARE ARCHITECTURE TO ANOTHER. THIS IS ESPECIALLY TRUE IN REAL-TIME SYSTEMS WHERE THE TIMING BEHAVIOR AND SCHEDULING CHARACTERISTICS OF THE RUNTIME ENVIRONMENT MUST BE KNOWN AND PREDICTABLE. A PROJECT IS PROPOSED TO RESEARCH MEANS OF ENABLING REUSE OF ARMY EMBEDDED REAL-TIME APPLICATIONS BY DEVELOPING REUSABLE ADA RUNTIME ENVIRONMENTS THAT AN BE PORTED ACROSS HARDWARE ARCHITECTURES. THE PROJECT WILL EXAMINE THE ARMY'S REQUIREMENTS AND WILL DERIVE THE REQUIREMENTS FOR THE RUNTIME ENVIRONMENTS. CANDIDATE APPROACHES WILL BE IDENTIFIED AND EVALUATED. THE MOST PROMISING SOLUTION WILL BE SELECTED FOR IMPLEMENTATION IN A PHASE II EFFORT.

BRIMROSE CORP OF AMERICA
5020 CAMPBELL BLVD
BALTIMORE, MD 21236
Program Manager: J I SOOS
Contract #:
Title: SIMULTANEOUS ACOUSTO-OPTIC AND ELECTRO-OPTIC TECHNOLOGY FOR VERY ACCURATE LASER BEAM POINTING
Topic #: A90-230 Office: CECOM ID #: 41982

ACOUSTO-OPTIC AND ELECTRO-OPTIC DEFLECTORS CAN BE USED AS A VERY FAST AND ACCURATE LAER BEAM STEERING AND POINTING DEVICES WITH NO MOVING PARTS. COMPARED TO A MECHANICAL GIMBAL, THEY ARE SMALL SIZE (IN A RANGE OF 1/2x1/2x1/2 INCH), LIGHTWEIGHT, AND LOW POWER CONSUMPTION. THE LATEST TECHNOLOGICAL ADVANCES IN HIGH FREQUENCY ACOUSTO-OPTIC TECHNOLOGY GIVES THE CAPABILITIES OF 20 MICRORADIANS ACCURACIES OF LASER BEAM POINTING, UP TO 10 DEG ANGULAR SCANNING, AND SIMULTANEOUS BEAM MODULATION. SINCE THERE IS NO MECHANICALLY MOVING ELEMENTS, THE AO AND E-O DEVICES ARE VERY WELL SUITABLE FOR FIELD APPLICATIONS IN A VIBRATING ENVIRONMENT. PRESENTLY THE STATE-OF-THE-ART BRIMROSE A-O DEVICES HAVE CAPABILITIES OF 3 DEG SCANNING ANGLES WITH 2000 POINTS RESOLUTION, WHICH TRANSLATES TO 26 MICRORADIANS OF ANGULAR RESOLUTION AT VISIBLE AND NEAR IR LASER WAVELENGTHS. WE WOULD LIKE TO OBTAIN THE SAME ABOVE RESULTS FOR A ONE JOULE Nd-YAG SOURCE AT ITS PRIME AND HARMONICALLY GENERATED WAVELENGTHS. IN PHASE I OF THIS PROGRAM, BRIMROSE WILL EVALUATE BOTH TECHNIQUES AND DETERMINE THEIR CAPABILITIES FOR 1.06 um AND 0.532 um LASER BEAMS POINTING WITH 20 MICRORADIANCE OF ANGULAR RESOLUTION AS WELL AS DESIGN THE DEVICE UPON SELECTION OF THE MOST SUITABLE TECHNOLOGY. WE WILL DEFINE THE RELA- TIONS BETWEEN ANGULAR RESOLUTION, DIFFRACTION EFFICIENCY, AND SCANNING ANGLE. A NEW TYPE OF A SIMULTANEOUS ACOUSTO-ELECTRO-OPTIC (AEO) DEFLECTOR DEVICE WILL BE ANALYZED TO COMBINE THE BEST PROPERTIES OF BOTH TECHNIQUES. THIS DEFLECTOR WILL COMBINE BOTH ACOUSTO-OPTIC AND ELECTRO-OPTIC POINTING TECHNIQUES IN ONE DEVICE. THIS CONCEPT HAS ALREADY SUCCESSFULLY BEEN DEMONSTRATED ON A SBIR PHASE I CONTRACT FROM SDIO FOR 633nm. IN THE LAST 8 YEARS, BRIMROSE HAS BEEN A PIONEER IN DESIGNING AND CONSTRUCTING OF ACOUSTO-OPTIC AND ELECTRO-OPTIC LASER BEAM SCANNERS, DEFLECTORS, POINTERS, AND MODULATORS.... THE LATEST AND NEWEST PRODUCT DEVELOPED AT BRIMROSE IS AN ACOUSTO-ELECTRO-OPTIC DEFLECTOR-MODULATOR COMBINING BOTH TECHNOLOGIES IN A ONE SINGLE DEVICE. IN PHASE I, BRIMROSE WILL DESIGN AND FABRICATE A PROOF-OF-CONCEPT SIMULTANEOUS AEO POINTING SYSTEM FOR YAG.

ELECTRONIC DECISIONS INC
1776 E WASHINGTON ST
URBANA, IL 61801
Program Manager: DR ROBERT J KANSY
Contract #:

Title: ACT PROCESSORS FOR ECM APPLICATIONS
Topic #: A90-231 Office: CECOM ID #: 41970

WITH INCREASING WAVEFORM COMPLEXITY AND EMITTER DENSITY IN THE TACTICAL ELECTROMAGNETIC SIGNAL ENVIRONMENT, THE JOB OF INTERCEPTING AND IDENTIFYING POTENTIALLY THREATS HAS OVERWHELMED THE CAPABILITIES OF CONVENTIONAL ESM RECEIVERS. THIS PROPOSAL DESCRIBES A PROGRAM TO STUDY THE APPLICATION OF ACOUSTIC CHARGE TRANSPORT (ACT) TECHNOLOGY TO ADVANCED ESM RECEIVER ARCHITECTURES. ACT IS AN EMERGING TECHNOLOGY WHICH ALLOWS PRECISION ANALOG TRANSVERSAL FILTERS TO BE INTEGRATED WITH AMPLIFIERS, DETECTORS, COMPARATORS, AND DIGITAL INTERFACE AND CONTROL CIRCUITS IN A SINGLE GaAs CHIP. THE MAIN FOCUS OF THE PROPOSED STUDY WILL BE TO DETERMINE THE EXTENT TO WHICH INTEGRATION OF THE RF FUNCTIONS FOR TWO SPECIFIC ESM RECEIVER ARCHITECTURES CAN BE ACHIEVED TO REALIZED THE BENEFITS OF MINIATURI- ZATION AND RELIABILITY WHILE MAINTAINING ACCEPTABLE PERFORMANCE AGAINST TYPICAL TACTICAL SIGNAL ENVIRONMENTS. THE ARCHITECTURE TO BE STUDIED ARE THE CHANNELIZED RECEIVER AND THE MICROSCAN RECEIVER.

INTER-SCIENCE INC
105 JORDAN RD
TROY, NY 12180
Program Manager: DR JAMES CASTRACANE
Contract #:
Title: ADVANCED MICROCHANNEL PLATE BASED LASER DETECTOR INTENSIFIERS
Topic #: A90-233 Office: CECOM ID #: 41983

IN A WIDE VARIETY OF APPLICATIONS, THE DETECTION OF EXTREMELY LOW LEVELS OF LIGHT IS NECESSARY. CERTAIN, PRESENT DAY SYSTEMS USED BY THE U.S. ARMY INCORPORATE HIGH SPEED PIN SILICON DETECTORS. FOR EXAMPLE, THESE DETECTORS FORM THE HEART OF SOME LASER RANGING SYSTEMS AND ARE INVALUABLE BECAUSE OF THEIR SHORT RISE TIMES AND HIGH SENSITIVITY. HOWEVER, THE INCLUSION OF A LIGHT AMPLIFICATION STAGE BEFORE THE PIN PHOTODIODES CAN EXTEND THEIR RANGE SIGNIFICANTLY. FOR THIS APPLICATION, AN IDEAL CHOICE IS THE MICROCHANNEL PLATE (MCP). THE MCP HAS FOUND WIDESPREAD USE IN IMAGE SENSING, SPECTROSCOPY AND OTHER APPLICATIONS REQUIRING HIGH RESOLUTION, LOW LIGHT LEVEL DETECTION. THE HIGH GAIN AND FAST TIME RESPONSE OF THE MCP CAN BE EXPLOITED TO PRODUCE A COMPOUND DETECTOR FOR MEASURING EXTREMELY LOW LIGHT LEVELS INCLUDING DIRECT PHOTON COUNTING. THE EXTENDED SURFACE OF THE MCP OPENS POSSIBILITIES FOR SPATIALLY RESOLVED DETECTION OF SOURCES WHEN COUPLES TO PIN PHOTODIODE ARRAYS. THE PROPOSED PHASE I EFFORT WILL OPTIMIZE THE COUPLING OF AN MCP TO A PIN SILICON DETECTOR INCLUDING AN IN-DEPTH ANALYSIS TO MODEL THE INCREASE IN PERFORMANCE EXPECTED FROM THIS COMPOUND SYSTEM. THIS STUDY WILL SERVE AS A FOUNDATION FOR IMPLEMENTATION AND TESTING OF THE DETECTOR SYSTEM IN PHASE II.

E-TEK DYNAMICS INC
1885 LUNDY AVE
SAN JOSE, CA 95131
Program Manager: J J PAN
Contract #:
Title: OPTICAL MODULATOR
Topic #: A90-234 Office: CECOM ID #: 41984

IN PHASE I, E-TEK WILL ANALYZE, DESIGN AND OPTIMIZE TWO INNOVATIVE WIDE BAND IR-EO MODULATORS FOR COUNTER-MEASURE SYSTEMS. THESE TWO INNOVATIVE IR-EO MODULATORS PROVIDE 1 ~ 5 um MODULATION BANDWIDTH, > 10 W THROUGHPUT POWER, 20 - 2000 Hz MODULATION RATE, < 1 us AGILITY TIME AND SMALL SIZE/LIGHT WEIGHT. WITH E-TEK'S MANY YEARS OF EXPERIENCE IN DEVELOPING INTEGRATED OPTICAL DEVICES, HIGH DAMAGE THRESHOLD NONLINEAR EO MATERIAL, HIGH

FREQUENCY EOM, COMPUTER-AIDED MODELING AND SOPHISTICATED PACKAGE DESIGN, PHASE I INVESTIGATION WILL LEAD DIRECTLY TO PHASE II HARDWARE IMPLEMENTATION, EVALUATION AND DEMONSTRATION.

DELTA INFORMATION SYSTEMS INC
300 WELSH RD - BLDG 3
HORSHAM, PA 19044
Program Manager: NEIL C RANDALL
Contract #:
Title: VIDEO BANDWIDTH REQUIREMENTS FOR REMOTED APPLICATIONS
Topic #: A90-235 Office: CECOM ID #: 41959

THIS DOCUMENT IS A TECHNICAL PROPOSAL TO DETERMINE BANDWIDTH REQUIREMENTS FOR TRANSMITTING VIDEO SIGNALS THAT WILL BE USED FOR TELEOPERATION OF MILITARY VEHICLES. DELTA PROPOSED TO PERFORM EXPERIMENTS, USING A DUAL-CONTROL VEHICLE THAT WILL ESTABLISH FRAME RATE REQUIREMENTS FOR THE REMOTE DRIVING OF VEHICLES. STUDIES WILL ALSO BE MADE OF THE REQUIREMENTS FOR THE ACQUISITION AND TRACKING OF GROUND AND AIRBORNE TARGETS. FROM THE FRAME RATE AND RESOLUTION REQUIREMENTS, THE DIGITAL BIT RATE REQUIRED TO TRANSMIT FROM REMOTED VEHICLES USING APPROVED RF FREQUENCIES WILL BE ESTIMATED.

OXFORD COMPUTER INC
39 OLD GOOD HILL RD
OXFORD, CT 06483
Program Manager: STEVEN G MORTON
Contract #:
Title: NON-VOLATILE VHSIC-DENSITY NEURAL NETWORK CHIP WITH VARIABLE WAFER DICING
Topic #: A90-236 Office: CECOM ID #: 41960

RECENT DEVELOPMENTS IN NEURAL NETWORKS HAVE SHOWN THAT THEIR EFFECTIVE APPLICATION IS DEPENDENT UPON THE ABILITY TO PRODUCE VERY LARGE NETWORKS WITH HIGH CONNECTIVITY. AS A RESULT, EXTREMELY POWERFUL NEURAL NETWORKS ARE REQUIRED TO SOLVE MANY VITAL DOD PROBLEMS IN REAL-TIME. THESE NETWORKS MUST HAVE A MODULAR STRUCTURE SO THAT INCREASINGLY POWERFUL NETWORKS CAN BE BUILT EASILY. WE PROPOSE TO CHOOSE A REPRESENTATIVE SET OF NEURAL NETWORK ARCHITECTURES WITH APPROPRIATE LEARNING RULES AND DEFINE A SINGLE, VHSIC-DENSITY CHIP ARCHITECTURE THAT CAN SUPPORT ALL OF THEM. WE WILL DEVELOP A COMPUTER MODEL OF THE CHIP AND SHOW THAT IT SUPPORTS THESE NEURAL NETWORK ARCHITECTURES. TO HANDLE MANUFACTURING DEFECTS THAT ARE INEVITABLE IN THE PRODUCTION OF COMPLEX CHIPS, WE FURTHER PROPOSE TO DEFINE A CHIP ARCHITECTURE THAT ENABLES DIFFERENT NUMBERS OF UNSAWN DICE TO BE MECHANICALLY AND ELECTRICALLY CONNECTED TOGETHER. THIS WILL PROVIDE MANY OF THE PRESUMED ADVANTAGES OF WAFER SCALE INTEGRATION, BUT RESULT IN LARGE NUMBERS OF USABLE DEVICES. TO STORE THE WEIGHT MATRICES THAT ARE BING UPDATED BY LEARNING ALGORITHMS DURING OPERATION OF THE SYSTEM, WE FURTHER PROPOSE TO INVESTIGATE THE APPLICATION OF FERROELECTRIC MEMORY TECHNOLOGY.

GREEN MOUNTAIN RADIO RESEARCH CO
50 VERMONT AVE - FT ETHAN ALLEN
COLCHESTER, VT 05446
Program Manager: DR FREDERICK H KAAB
Contract #:
Title: FEASIBILITY STUDY OF HIGH-EFFICIENCY RF-POWER COMBINERS
Topic #: A90-237 Office: CECOM ID #: 41971

MODERN HF/VHF JAMMERS EMPLOY POWER COMBINERS AND MULTIPLE POWER-AMPLIFIER (PA) MODULES TO ACHIEVE A HIGH POWER OUTPUT, CANCELLATION OF HARMONICS, AND GRADUAL DEGRADATION OF PERFORMANCE DUE TO MODULE FAILURE. POWER COMBINERS CAN BE A SIGNIFICANT SOURCE OF POWER LOSS BECAUSE OF RESISTIVE LOSSES, MISMATCH (AMPLITUDE/ PHASE) OF PA OUTPUTS, AND PA INEFFICIENCY DUE TO NONNOMINAL LOAD. CURRENT- AND VOLTAGE-SUMMING COMBINERS HAVE NO INTRINSIC LOSSES, BUT PROVIDE NEITHER ISOLATION NOR CONSTANT IMPEDANCE. HYBRID COMBINERS PROVIDE ISOLATION, BUT ARE INEFFICIENT WHEN THE INPUT SIGNALS DIFFER IN AMPLITUDE AND/OR PHASE. DIRECTIONAL AND QUADRATURE COUPLERS PROVIDE CONSTANT IMPEDANCE, BUT ARE INEFFICIENT FOR MISMATCHED AMPLITUDE, PHASE, OR LOAD IMPEDANCE. A VARIATION ON THE LUMPED-ELEMENT WILKINSON COMBINER AND ADAPTIVE INTERCONNECTION APPEARS ATTRACTIVE. HOWEVER, EACH TYPE OF COUPLER HAS ITS OWN CHARACTERISTICS, AND A SINGLE TYPE OF COMBINER MAY NOT BE OPTIMUM FOR ALL APPLICATIONS. THE PROPOSED PROGRAM WILL CONDUCT THE GROUND WORK NECESSARY FOR SYNTHESIS AND IMPLEMENTATION OF HIGH-EFFICIENCY POWER COMBINERS. ITS PRINCIPAL COMPONENTS ARE: ANALYSIS OF DIFFERENT COMBINERS IN A COMMON FRAMEWORK, COMPARISON OF THEIR EFFECTS UPON PAs, DETERMINATION OF TRADE-OFFS BETWEEN COUPLER LOSS AND PA EFFICIENCY, AND IDENTIFICATION OF THE MOST PROMISING APPROACHES FOR DEVELOPMENT.

CONSULTANT'S CHOICE INC
8800 ROSWELL RD
ATLANTA, GA 30350
Program Manager: STEPHEN K FITZPATRICK
Contract #:
Title: DESIGN OF A TACTICAL MULTI-MEDIA INFORMATION COMMUNICATION SYSTEM (MMICS)
Topic #: A90-239 Office: CECOM ID #: 41967

MULTI-MEDIA APPLICATIONS INVOLVE THE REPRESENTATION, STORAGE, RETRIEVAL, AND COMMUNICATION OF INFORMATION EXPRESSED IN VARIOUS MEDIA, SUCH AS TEXT, VOICE, GRAPHICS, IMAGES, AUDIO, AND VIDEO. ALTHOUGH MUCH WORK HAS BEEN DONE IN THE FIELD OF MULTI-MEDIA RECENTLY, RESEARCH HAS NOT APPLIED MULTI-MEDIA FUNCTIONALITY TO A TACTICAL SETTING. A DESIGN APPROACH IS PROPOSED FOR THE DEVELOPMENT OF A TACTICAL MULTI-MEDIA INFORMTION COMMUNICATIONS SYSTEM (MMICS). IN A LAYERED ARCHITECTURE, MULTI-MEDIA APPLICATIONS ARE FACILITATED BY APPLICATION LAYER SERVICES (SUCH AS THE HANDLING, MANIPULATION, AND SYNCHRONIZATION OF DATA STREAMS) AND BY A ROBUST UNDERLYING COMMUNICATIONS NETWORKS, WHICH MUST GUARANTEE PERFORMANCE LEVELS AND EFFECTIVE BANDWIDTH UTILIZATION FOR THE VARIOUS DATA TYPES. OPERATION IN A TACTICAL ENVIRONMENT ENTAILS ADDITIONAL NETWORK PROVISIONS FOR SECURITY, MOBILITY, DEPLOYMENT FLEXIBILITY, AND SURVIVABILITY. THE MMICS WILL BRING TOGETHER STATE-OF-THE-RT MULTI-MEDIA CAPABILITIES AND A COMMUNICATIONS NETWORK APPROPRIATE FOR A TACTICAL ENVIRONMENT. DESIGN DECISIONS WILL BE BASED ON AN ANALYSIS OF USER REQUIREMENTS FOR MULTI-MEDIA APPLICATIONS AND COMMUNICATIONS CONNECTIVELY IN THE VARIOUS FUNCTIONAL AREAS OF THE TACTICAL ARMY. THE MMICS DESIGN WILL BE GUIDED BY A DESIGN PHILOSOPHY WHICH SUPPORTS RAPID SYSTEM PROTOTYPING IN A COST EFFECTIVE MANNER.

CENTER FOR REMOTE SENSING
PO BOX 9244
McLEAN, VA 22102
Program Manager: SUMAN GANGULY
Contract #:
Title: IMPROVED PROPAGATION PREDICTION BASED ON PHYSICAL IONOSPHERIC MODEL
Topic #: A90-240 Office: CECOM ID #: 41968

HF CHANNEL PRESENTS SEVERAL TECHNICAL CHALLENGES BECAUSE OF THE DYNAMIC PROPERTIES OF

THE PROPAGATION MEDIUM. WE PROPOSE TO DEVELOP A SIMPLE PHYSICAL MODEL OF THE IONOSPHERE - WHICH WILL ALLOW REAL TIME UPDATE WITH DATA ACQUIRED FROM OBLIQUE AND VERITCAL SOUNDERS, COMMUNICATION LINKS AND OTHER SATELLITE AND GROUND BASED SOURCES. THE PHYSICAL MODEL WILL OPERATE IN A PC ENVIRONMENT AND THUS WILL ENHANCE THE CAPABILITIES OF A FULLY ADAPTIVE AND AUTOMATIC HF NETWORKING SCHEME. PHASE I OF THE PROPOSED EFFORT WILL BE DEVOTED MOSTLY IN DEVELOPING THE BASIC APPROACH INTO AN ADVANCED CONCEPTUAL DESIGN. THE KEY ELEMENT OF THE EFFORT IS DIRECTED TOWARDS DEMONSTRATION OF THE CAPABILITIES OF A SIMPLE PHYSICAL MODEL OF THE IONOSPHERE.

SPACE APPLICATIONS CORP
6720 SOUTHCENTER BLVD - STE 140
SEATTLE, WA 98188
Program Manager: DAVID F KINSEY
Contract #:
Title: TECHNOLOGY FOR REENGINEERING TACTICAL SOFTWARE SYSTEMS
Topic #: A90-241 Office: CECOM ID #: 41974

A COMPREHENSIVE METHODOLOGY FOR REENGINEERING TACTICAL SOFTWARE IS PROPOSED THAT WILL PROVIDE THE PLATFORM FOR INTEGRATING NEW AND EXISTING SOFTWARE ANALYSIS TOOLS INTO A COMPLETE TOOL SET. SUCH A TOOL SET WOULD ASSIST THE SOFTWARE ENGINEER IN QUICKLY AND EFFICIENTLY DETERMINING THE FUNCTIONAL AND BEHAVIORAL CHARACTERISTICS OF THE EXISTING SOFTWARE SO THAT THE ORIGINAL DESIGN CAN BE MANIPULATED AND REIMPLEMENTED IN STRUCTURED ADA. OUR CONCEPT USES EXISTING LEXICAL TRANSLATORS TO CREATE AN EQUIVALENT "DRAFT-ADA" SOURCE FROM THE ORIGINAL NON-ADA SOURCE CODE. THEN, SOFTWARE ANALYSIS TOOLS ARE APPLIED WITHIN THE FRAMEWORK OF OUR REENGINEERING METHODOLOGY TO ASSIST THE SOFTWARE ENGINEER IN REFINING THIS ROUGH ADA CODE INTO A USABLE PRODUCT. OUR CONCEPT ALLOWS THE USER TO EMPLOY DESIGN AND CODE ELEMENTS FROM THE EXISTING SOFTWARE, AS WELL AS INCORPORATE NEW REQUIREMENTS.

ANALYSIS & SIMULATION INC
ONE AMERICAN PK - 172 HOLTZ RD
BUFFALO, NY 14225
Program Manager: PAUL PATTI
Contract #:
Title: PASSIVE AND ACTIVE RF DECOY EFFECTIVENESS EVALUATION (PARDEE) MODEL
Topic #: A90-242 Office: CECOM ID #: 41985

THE NEED EXISTS FOR A SIMULATION CAPABLE OF PREDICTING THE EFFECTIVITY OF ACTIVE AND PASSIVE RF DECOYS IN TERMS OF ARMY AIRFRAME SURVIVABILITY AND MISSION EFFECTIVENESS WHEN EMPLOYED IN ENVIRONMENTS INVOLVING BOTH SINGLE AND MULTIPLE THREATS. THE OBJECTIVE OF THE PHASE I EFFORT IS TO DEMONSTRATE THE FEASIBILITY OF THE APPROACH BEING PROPOSED BY IMPLEMENTING AND DEMONSTRATING A PROTOTYPE CAPABLE OF PREDICTING AIRFRAME SURVIVABILITY IN A ONE-ON-ONE ENVIRONMENT. IN ADDITION, THE PHASE I EFFORT WILL: (1) ESTABLISH THE BASIC SIMULATION REQUIREMENTS AND DEFINE A FUNCTIONAL DESCRIPTION; (2) IDENTIFY EXISTING USEFUL ALGORITHMS, MODULES, OR EXPLOITABLE IDEAS APPLICABLE TO MEETING THE REQUIREMENTS; AND (3) CONCEPTUALIZE A SIMULATION APPROACH. THE RESULTS OF PHASE I WILL PROVIDE A FIRM BASIS AND DIRECTION FOR FORMULATION OF A PHASE II DEVELOPMENT PLAN.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 1422
Program Manager: DAVID A MACALUSO

Contract #:
Title: DIGITAL INTERFACE BETWEEN MULTISPECTRAL FORCE LAYDOWN AND MULTISPECTRAL ENVIRONMENT GENERATOR
Topic #: A90-243 Office: CECOM ID #: 41986

A METHOD OF CONVENIENTLY ADOPTING EXISTING SCENARIO LAYDOWNS TO A FORM COMPATIBLE WITH EXISTING MULTISPECTRAL SIMULATOR WILL ALLOW FACILITIES SUCH AS THE CECOM CENTER FOR EW/RSTA TO QUICKLY AND ECONOMICALLY CONFIGURE TEST SCENARIOS. NUMEROUS "BLESSED" MULTISPECTRAL LAYDOWNS EXIST THAT COULD BE IMPLEMENTED INTO SIMULATOR TESTING METHODOLOGIES WITH A MULTISPECTRAL INTERFACE. A COMPLEMENTARY METHOD FOR RAPIDLY EDITING FLIGHT PATHS THROUGH THE LAYDOWN OF INTEREST WILL ALSO FACILITATE TEST PROCESS. THIS STUDY WILL ESTABLISH A ROADMAP AND DESIGN ARCHITECTURE FOR ENHANCING THE EW/RSTA MSEG FACILITY. WHILE THE STUDY WILL FOCUS ON THE DESIGN OF A MULTISPECTRAL INTERFACE AND FLIGHT PATH EDITOR, THE PLAN WILL ALSO INCLUDE BRINGING ADDITIONAL UPGRADES TO THE MSEG. AMHERST SYSTEMS IS IN AN UNIQUE POSITION TO DEVELOP A COST EFFECTIVE SET OF UPGRADES, GIVEN THEIR EXTENSIVE SIMULATOR DEVELOPMENT EXPERIENCE.

ADAPTIVE SENSORS INC
216 PICO BLVD - STE 8
SANTA MONICA, CA 90405
Program Manager: DR HAROLD M FINN
Contract #:
Title: ADAPTIVE ARRAY TECHNOLOGY FOR TRANSPORTABLE LONG WAVELENGTH GROUND-BASED BISTATIC RADAR SYSTEMS
Topic #: A90-244 Office: CECOM ID #: 41987

LONG WAVELENGTH GROUND-BASED MULTISTATIC RADAR SYSTEMS WHICH MAY BE IN THE HF, VHF, OR UHF BANDS OFFER POTENTIAL SOLUTIONS TO THE PROBLEMS ASSOCIATED WITH PERFORMING THE TACTICAL ARMY MISSION OF FOREWARD AREA AIR DEFENSE (FAAD) AND WEAPONS LOCATION WITH MONOSTATIC SHORT WAVELENGTH RADARS. HOWEVER, SIGNIFICANT PROBLEMS ARE ALSO INTRODUCED WITH THE USE OF THESE LONG WAVELENGTH BISTATIC RADAR SYSTEMS. THE PROBLEMS INTRODUCED ARE PRIMARILY IN THE CATEGORY OF INCREASED JAMMER SUSCEPTIBILITY AND THE INTRODUCTION OF MULTIPLE DIRECTIVE NARROW BAND INTERFERENCE SOURCES. SYSTEM CONCEPTS COUPLED WITH APPROPRIATELY SPECIALIZED SPATIAL ADAPTIVE NULLING TECHNIQUES, PROPOSED TO BE FURTHER DEVELOPED DURING THE PHASE I PROGRAM, ARE DESIGNED TO OVERCOME THE PROBLEMS ASSOCIATED WITH THE USE OF THE SUBJECT BISTATIC LONG WAVELENGTH RADAR SYSTEMS SO THAT THEIR ADVANTAGES CAN BE REALIZED IN TECHNICALLY FEASIBLE SYSTEM DESIGNS. A PHASE II PROGRAM BASED ON THE VALIDATION AND FURTHER DEVELOPMENT OF THE DEVELOPED DESIGNS BY SIMULATION EXPERIMENTS MAKES USE OF DIGITALLY RECORDED MULTIPLE CHANNEL FRONT-END-OF-THE-RADAR FIELD TEST DATA AS PROGRAM INPUTS.

MERIT TECHNOLOGY INC
5068 W PLANO PKWY
PLANO, TX 75093
Program Manager: MICHAEL E GOSS
Contract #:
Title: DIGITAL TERRAIN MODEL SYNTHESIS (DTMS)
Topic #: A90-245 Office: CECOM ID #: 41977

DIGITAL TERRAIN DATABSES ARE WIDELY USED FOR GENERATION OF THREE- DIMENSIONAL SYNTHETIC IMAGES FOR APPLICATIONS RANGING FROM FLIGHT SIMULATION TO SENSOR MODELING. GENERATION OF IMAGES WITH HIGH VISUAL FIDELITY REQUIRES HIGH RESOLUTION ELEVATION DATA WITH DETAILED SURFACE CHARACTERISTIC INFORMATION. THIS REQUIREMENT FOR HIGH RESOLUTION IN TURN REQUIRES

SOLUTIONS TO PROBLEMS OF DATA ACQUISITION AND DATA STORAGE CAPACITY REQUIREMENTS. MERIT PROPOSES TO ADDRESS THESE PROBLEMS BY USING FRACTAL TECHNIQUES TO SYNTHESIZE REALISTIC HIGH RESOLUTION TERRAIN DATA. ALGORITHMS WILL BE DESIGNED TO GENERATE DATA WHICH INCREASES THE APPARENT RESOLUTION OF ELEVATION (DTED) AND FEATURE (DFAD) DATA, AND ALSO ALLOWS TOTALLY SYNTHETIC ELEVATION DATA TO BE GENERATED. STORAGE PROBLEMS WILL BE ADDRESSED BY DESIGNING A DATABASE WHICH WILL RAPIDLY SYNTHESIZE DATA ON DEMAND, AND THEN RELEASE STORAGE WHEN DATA IS NO LONGER IN USE. DURING PHASE I MERIT WILL PRODUCE AND DEMONSTRATE SOFTWARE TO GENERATE A DATABASE CONTAINING CO-REGISTERED DTED AND DFAD. THE SOFTWARE WILL ALSO DISPLAY SYNTHETIC IMAGES GENERATED FROM THIS DATABASE. IN PHASE II MERIT WILL EXTEND THIS SOFTWARE TO PRODUCE A TERRAIN MODEL SYSTEM INCORPORATING DTED, DFAD, TEXTURE IMAGES, AND SYNTHETIC TERRAIN AND TEXTURE DATA.

SIGNAL ANALYTICS CORP
374 MAPLE AVE E - STE 200
VIENNA, VA 22180
Program Manager: DR ROBERT FONTANA
Contract #:
Title: A NEURAL NETWORK FOR AEJ SITUATION ASSESSMENT AND RESOURCE MANAGEMENT
Topic #: A90-246 Office: CECOM ID #: 41988

THE INABILITY OF THE CURRENT STATE-OF-THE-ART IN COMPUTING TO SUPPORT CONVENTIONAL ALGORITHMIC APPROACHES TO THE SITUATIONAL ASSESSMENT AND RESOURCE ALLOCATION PROBLEMS FACING THE APACHE ESCORT JAMMER NECESSITATES THE INTRODUCTION OF NOVEL SOLUTIONS, SUCH A NEURAL NETWORK TECHNIQUE, TO THIS PROBLEM. IN PHASE I, WE PROPOSE THE INVESTIGATION OF A DUAL NEURAL NETWORK ARCHITECTURE TO PERFORM THE TASKS OF SITUATIONAL ASSESSMENT AND RESOURCE MANAGEMENT: THE PROPOSED SITUATIONAL ASSESSMENT NEURAL NETWORK IS BASED UPON THE CONCEPT OF A FUZZY COGNITIVE MAP (FCM). BEING FEEDBACK GENERALIZA- TIONS OF SEARCH TREES, FCMs OVERCOME THE PROCESSING SPEED PROBLEMS OF CONVENTIONAL AI OR EXPERT SYSTEMS APPROACHES AND HAVE THE ADDITIONAL ADVANTAGE OF BEING ABLE TO NATURALLY COMBINE EXPERT KNOWLEDGE FROM MULTIPLE SOURCES. THE NETWORK IS DESIGNED TO INTERFACE DIRECTLY WITH THE AVIONICS AND EW EQUIPMENT AND PROVIDES INPUTS TO A NEURAL NETWORK CONTROLLER. THE NEURAL NETWORK CONTROLLER UTILIZES AN EXTENSION OF PROVEN CONCEPTS FROM OPTIMAL CONTROL THEORY. THE NETWORK MAKES USE OF INHIBITORY FEEDBACK WHICH PROVIDES COMPETITION AND COOPERATION AMONG THE AVIONICS AND EW RESOURCES IN DETERMINING THE OPTIMAL RESPONSE STRATEGY. THE NETWORK OUTPUTS PROVIDE FOR THE CONTROL OF BOTH TIME-RENEWABLE (E.G., POWER MANAGEMENT) AND EXPENDABLE (E.G., CHAFF/FLARE) ASSETS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR LAWRENCE H DOMASH
Contract #:
Title: LOW-COST HIGH RESOLUTION HOLOGRAPHIC OPTICAL ELEMENTS
Topic #: A90-247 Office: CECOM ID #: 41978

HOLOGRAPHIC AND BINARY OPTICAL ELEMENTS (HOBO) ARE REQUIRED FOR A WIDE VARIETY OF OPTICAL COMPUTING SYSTEMS, AND ARE EMERGING AS AN IMPORTANT ALTERNATIVE TO CONVENTIONAL OPTICAL ELEMENTS FOR MANY COMMERCIAL AND MILITARY OPTICAL SYSTEMS. AT PRESENT, THE DESIGN AND FABRICATION OF HOBO IS EXPENSIVE AND CUMBERSOME, RELYING ON MAINFRAME COMPUTERS AND MULTIMILLION DOLLAR ELECTRON-BEAM LITHOGRAPHY FACILITIES DESIGNED FOR IC PRODUCTION. THE PROPOSED RESEARCH WILL DEMONSTRATE THE FABRICATION OF HIGH QUALITY HOBO ELEMENTS WITH 0.1 um RESOLUTION USING SCANNING ELECTRON MICROSCOPES AT A SMALL FRACTION OF THIS COST. WE WILL ALSO SHOW THAT IT IS POSSIBLE TO INTERFACE THIS SYSTEM TO THE INDUSTRY-STANDARD

COMPUTER GRAPHICS LANGUAGE POSTSCRIPT, OPENING AN ENORMOUS BASE OF EXISTING SCIENTIFIC/CAD AND MATHEMATICAL SOFTWARE TO DIRECT RECORDING WITH THE SCANNING ELECTRON MICROSCOPE. THE GOAL IS A COMMERCIAL SYSTEM INCORPORATING THE "WORLD'S HIGHEST RESOLUTION PRINTER" CAPABLE OF RECORDING HOBO AND OTHER FINE-SCALE SCIENTIFIC PATTERNS AT 254,000 PIXELS PER INCH.

RATIO METRICS INC
430 MARRETT RD - STE 3
LEXINGTON, MA 02173
Program Manager: EDWARD A STARR
Contract #:
Title: INVESTIGATION OF MIDIS TECHNOLOGIES AND APPLICATIONS APPLICATIONS
Topic #: A90-248 Office: CECOM ID #: 41962

DEPLOYED SYSTEMS USE INCREASINGLY COMPLICATED TECHNOLOGY, INCREASING THE DIFFICULTIES OF THE TASKS OF BOTH OPERATORS AND MAINTAINERS. TECHNOLOGY MUST ALSO BE USED TO COMPENSATE FOR THIS INCREASED BURDEN. MIDIS IS AN EXAMPLE OF THIS TECHNOLOGY. THE OBJECTIVES OF THE EFFORT ARE TO DETERMINE THE FUNCTIONAL REQUIREMENTS FOR A SUCCESSFUL MIDIS CAPABILITY, TO DETERMINE WHAT TECHNOLOGIES PROVIDE THIS CAPABILITY, TO DETERMINE IF THE SIZE/COST/UTILITY PROVIDE A VIABLE CAPABILITY, AND TO EXAMINE HOW THE MAINTAINER CAN BEST UTILIZE THE FUNCTIONALITY. EFFORT IS PROPOSED TO 1) EXPLORE MAINTENANCE STRATEGIES UTILIZING THE MIDIS CONCEPT, 2) ESTABLISH FUNCTIONAL REQUIREMENTS FOR THE MIDIS CAPABILITY TO REDUCE OPERATION AND SUPPORT COSTS, 3) PERFORM A TECHNOLOGY SEARCH FOR APPROACHES TO MEET THE NEEDED CAPABILITIES, AND 4) SELECT TECHNICAL APPROACH(ES) FOR A FAMILY OF MIDIS COMPONENTS.

FASTMAN INC
1414 MILLARD ST
BETHLEHEM, PA 18018
Program Manager: DR MICHAEL TUCKER
Contract #:
Title: A CENTER FREQUENCY/BANDWIDTH DETECTOR
Topic #: A90-249 Office: CECOM ID #: 41989

THE GOAL OF THIS RESEARCH IS TO DEVELOP A PROCESSOR WHICH USES TIME-FREQUENCY TRANSFORMS TO EXTRACT THE INSTANTANEOUS FREQUENCY OF A SIGNAL IN REAL TIME. IN THE PROCESSOR, THE SIGNAL WILL BE SPLIT INTO TWO PATHS. IN ONE PATH THE SIGNAL WILL BE DIRECTED TO A DELAY LINE AND THEN TO PROGRAMMABLE FILTERS. IN THE OTHER PATH, THE SIGNAL WILL BE DIRECTED TO OUR TIME-FREQUENCY DETECTOR WHICH WILL MEASURE THE SIGNAL'S INSTANTANEOUS FREQUENCY AND GENERATE THE PROPER CONTROL SIGNALS FOR THE PROGRAMMABLE FILTERS. IN PHASE I WE WILL UNDERTAKE A MATHEMATICAL STUDY OF THE POSSIBLE TRANSFORM TECHNIQUES WHICH CAN BE USED TO DETECT THE INSTANTANEOUS FREQUENCY OF SIGNALS IN THE ESM/ELINT ENVIRONMENT AND THEN WE WILL DETERMINE METHODS TO IMPLEMENT THE TIME-FREQUENCY TRANSFORMS IN HARDWARE FOR REAL-TIME OPERATION.

LASER TECHNOLOGY ASSOCS INC
25 OZALID RD
JOHNSON CITY, NY 13790
Program Manager: DAVID C BROWN
Contract #:
Title: COMPREHENSIVE STUDY OF DIODE-PUMPED DYE LASERS
Topic #: A90-250 Office: CECOM ID #: 41990

DYE LASERS ARE UTILIZED IN A VARIETY OF SCIENTIFIC, COMMERCIAL, AND MILITARY APPLICATIONS, PRIMARILY DUE TO THEIR ABILITY TO BE TUNED OVER A BROAD SPECTRAL RANGE COVERING THE ULTRAVIOLET, VISIBLE, AND NEAR-INFRARED. THE EFFICIENCY OF DYE LASERS IS LOW, PRIMARILY DUE TO THE LOW EFFICIENCY OF OPTICAL SOURCES USED FOR DYE EXCITATION. IN RECENT YEARS, SEMICONDUCTOR DIODE LASERS HAVE BEEN WIDELY DEVELOPED AS SINGLE ELEMENTS, LINEAR ARRAYS, AND 2-DIMENSIONAL ARRAYS. FURTHERMORE, SIGNIFICANT PROGRESS HAS BEEN MADE IN THE POWER LEVELS AVAILABLE FROM SINGLE DIODES AND DIODE ARRAYS, AND SHORTER AND SHORTER WAVELENGTHS ARE BECOMING AVAILABLE. SINGLE DIODES CAN HAVE WALL PLUG EFFICIENCIES IN EXCESS OF 45% WHEREAS DIODE ARRAYS HAVE REPORTED EFFICIENCIES IN THE RANGE OF 30-40%. WE PROPOSE, DURING A PHASE I PROGRAM, TO COMPREHENSIVELY STUDY THE USE OF DIODE LASERS AND ARRAYS IN PUMPING DYE LASERS. ANALYSIS HAS SHOWN THAT A DRAMATIC INCREASE IN DYE LASER EFFICIENCY CAN BE REALIZED BY USING DIODES AS PUMP SOURCES. IN ADDITION, CONSIDERABLE FLEXIBILITY IN DYE LASER DESIGN AND WAVELENGTH AGILITY MAY BE ACHIEVED. DURING A PHASE II FOLLOW-ON PROGRAM, WE PROPOSE TO DEMONSTRATE AN OPTIMIZED DIODE-PUMP DYE LASER SYSTEM.

UNIVERSAL SENSORS INC
5258 VETERANS BLVD - STE D
METAIRIE, LA 70006
Program Manager: DR GRAHAM RAMSAY
Contract #:
Title: NATURAL MARINE ADHESIVE-BASED ELECTROCHEMICAL IMMUNOSENSORS FOR INFIELD PATHOGEN DETECTION
Topic #: A90-252 Office: CRDEC ID #: 41991

THE PROJECT OBJECTIVES ARE FIRSTLY, TO DEVELOP AN ANTIBODY IMMOBILIZATION METHOD USING NATURAL MARINE ADHESIVES THAT IS MORE EFFICIENT THAN CONVENTIONAL METHODS. THE SECOND OBJECTIVE IS TO USE SUCH A METHOD FOR THE DEVELOPMENT OF A NOVEL FLOW-BASED IMMUNOASSAY SYSTEM FOR THE RAPID DETECTION OF LOW PATHOGEN CONCENTRATIONS. THE IMMOBILIZATION EFFICIENCY OF NATURAL MARINE ADHESIVES AND CONVENTIONAL PROCEDURES FOR ANTI-ESCHERICHIA COLI ANTIBODIES WILL BE DETERMINED USING AN ENZYME-AMPLIFIED SANDWICH IMMUNOASSAY IN WHICH ALKALINE PHOSPHATASE LABELED ANTI-E COLI WILL DEVELOP CAPTURED SAMPLE E COLI CARBON, POLYTYRAMINE, CELLULOSE ACETATE, GLASS, POLYPROPYLENE AND POLYSTYRENE. ELECTROCHEMICAL MICROIMMUNOSENSOR WILL BE DEVELOPE USING THE ABOVE SANDWICH ASSAY PRINCIPAL AND AMPEROMETRIC DETECTION FOR A RANGE OF PATHOGENS. THEY WILL CONSIST OF A BASE ELECTRODE OF PLATINUM WIRE OR CARBON FIBER WHICH WILL BE PROTECTED AGAINST FOULING BY A THIN, PERMSELECTIVE MEMBRANE SUCH AS POLYTYRAMINE OR CELLULOSE ACETATE. ANTI-PATHOGEN ANTIBODY WILL BE EFFICIENTLY IMMOBILIZED ON THE ELECTRODE TIP AND NON-SPECIFIC ADSORPTION WILL BE MINIMIZE BY USE OF BOVINE SERUM ALBUMIN AND TWEEN 20. THE PROBES WILL BE DEIGNED TO GIVE RAPID AND REPRODUCIBLE RESPONSES IN ENVIRONMENTAL, FOOD AND CLINICAL SAMPLES WITH NO SAMPE PRETREATMENT. THEY WILL BE INCORPORATED INTO AN EASY TO USE, PORTABLE, INSTRUMENT FOR IN-FIELD DETERMINATION OF LOW PATHOGEN CONCENTRATIONS.

ROCKY MOUNTAIN INSTRUMENT CO
1501 S SUNSET ST
LONGMONT, CO 80501
Program Manager: DR MAL A AMINOU
Contract #:
Title: LOW COST LIGHT WEIGHT OPTICAL COMPONENTS FOR APPLICATION TO INFRARED DETECTION DEVICES
Topic #: A90-253 Office: CRDEC ID #: 41992

THE OBJECTIVE OF THIS PROPOSED PROGRAM WILL BE TO SELECT LOW COST, LIGHT WEIGHT MATERIALS TRANSMITTING IN THE INFRARED AND THEN TO DESIGN AND MAKE THE COMPONENTS, AND THE COATINGS THAT ARE SPECIFIED FOR FTIR DETECTION (WINDOWS, BEAMSPLITTERS, AND LENSES). THE INVESTIGATIONS WILL BE DIRECTED TOWARDS THE REVIEW OF MATERIAL TECHNOLOGIES SUCH AS Ge-BASED CHALCOGENIDES AND PLASTICS TO ACHIEVE THE SELECTION GOAL OF BOTH LOW COST AND LIGHT WEIGHT. THE EXPERIMENTAL PROGRAM WILL BE DIRECTED TOWARDS GAINING INSIGHT INTO THE EVALUATION OF TRANSMISSION PROPERTIES, HARDNESS FACTORS, HUMIDITY AND CHEMICAL ATTACK TOLERANCE. THE ELIGIBLE MATERIAL WILL BE COATED, TO OBTAIN TRANSPARENT OR SEMI-TRANSPARENT COMPONENTS. TESTS SUCH AS ADHESION, HUMIDITY, SALT SPRAY, SCRATCH, WILL BE CARRIED OUT IN ORDER TO DETERMINE OPTICAL AND MECHANICAL QUALITY OF THE COATED COMPONENTS. THE RESULTS OBTAINED DURING THIS PROGRAM CAN SUBSTANTIALLY REDUCE THE COST OF THE DETECTION SYSTEM ASSEMBLIES OVER THE CURRENTLY AVAILABLE ONES THAT USE EXPENSIVE MATERIALS SUCH AS ZnSe, ZnS, Ge, GaAs. CONSIDERABLE COST ECONOMIES CAN BE OBTAINED BY COMBINING, FOR EXAMPLE, PLASTIC OPTICAL ELEMENTS WITH OTHER STRONGER MATERIAL. PLASTICS AND CHALCOGENIDES CAN OFFER HIGH PERFORMANCE IF THEY ARE USED IN THE AREAS OF THEIR CAPABILITIES. THE COMMERCIALIZATION OF THESE INEXPENSIVE OPTICS WILL BENEFIT THE ENTIRE OPTICAL COMMUNITY.

ELECTRO-CHEM INC
400 W CUMMINGS PK
WOBURN, MA 01801
Program Manager: DR VINOD JALAN
Contract #:
Title: THIN FLEXIBLE AND CHEMICALLY SORPTIVE FILTER FOR NBC PROTECTION
Topic #: A90-254 Office: CRDEC ID #: 41993

THE DESIGN OF THE CURRENT NBC CANNISTER IS INCOMPATIBLE WITH MISSION RELATED REQUIREMENTS. A LOW-PROFILE/HIGH-EFFICIENCY FILTER, SUCH AS A THIN POROUS FILM OF CHEMICALLY SORPTIVE MATERIAL, COULD IDEALLY FUNCTION AS BOTH THE NBC FILTER AND PROTECTIVE HOOD WITHOUT INTERFERING WITH OTHER EQUIPMENT. THE OBJECTIVE OF THIS EFFORT IS TO EVALUATE A NEW TYPE OF AIR-PERMEABLE HYDROPHOBIC SORPTIVE FILTER SYSTEM FOR RESPIRATORY PROTECTION. USING APPROPRIATE SORBENTS MATERIALS (ULTRA-HIGH SURFACE AREA CARBON BLACKS, ACTIVATED AND CATALYZED CARBONS, OR CHARCOALS) AND BACKINGS (WOVEN OR NONWOVEN CLOTH OR HYDROPHOBIC PERMEABLE MEMBRANE), ELECTRO-CHEM WILL FABRICATE THIN, FLEXIBLE, AND BREATHABLE SORPTIVE FILTERS AND, IN PHASE I EFFORT, DEMONSTRATE THEIR EFFICACY WHEN CHALLENGED WITH LIQUID AND VAPOR AGENTS. PHASE II EFFORTS WILL OPTIMIZE THE FILTER-STRUCTURE AND ESTABLISH ITS EFFICACY AS AN NBC FILTER. THE PROPOSED APPROACH OFFERS THE PROBABILITY OF A SORPTIVE FILTER SYSTEM WITH EXTREME DESIGN VERSATILITY, SUBSTANTIALLY REDUCED WEIGHT, THICKNESS, AND COST, PLUS IMPROVED PERFORMANCE AND EASE OF INTEGRATION WITH OTHER SOLIDER-BORNE EQUIPMENT.

HAWAII BIOTECHNOLOGY GP INC
99-193 AIEA HEIGHTS DR
AIEA, HI 96701
Program Manager: DR T J G RAYBOULD
Contract #:
Title: UREASE-LINED IMMUNOASSAY REAGENT STABILITY STUDIES
Topic #: A90-256 Office: CRDEC ID #: 41994

UREASE OFFERS DISTINCT ADVANTAGES OVER OTHER ENZYMES FOR PREPARATION OF CONJUGATES USED IN ENZYME-LINKED IMMUNO-SORBENT ASSAY SYSTEMS. MOLECULAR DEVICES CORPORATION (MENLO PARK, CA) HAS CAPITALIZED ON THESE ADVANTAGES IN THEIR THRESHOLD SYSTEM. THIS IMPRESSIVE SYSTEM UTILIZES AVIDIN-BIOTIN TO "CAPTURE" ANALYTE-BOUND ANTIBODY-UREASE CONJUGATE

COMPLEXES ONTO A MEMBRANE, WHERE THEY ARE QUANTITATED BY A SENSOR THAT MONITORS THE FORMATION OF PRODUCT FROM THE UREASE-UREA REACTION. THE THRESHOLD SYSTEM IS OF INTEREST TO THE U.S. ARMY FOR A RANGE OF APPLICATIONS, BUT TO BE OF VALUE AS A FIELD DETECTOR, THE UREASE CONJUGATES REQUIRED MUST BE STABLE TO STORAGE AT ELEVATED TEMPERATURES FOR UP TO FIVE YEARS. METHODS WILL THEREFORE BE INVESTIGATED FOR PRODUCING HIGH ACTIVITY UREASE-ANTIBODY CONJUGATES THAT ARE STABLE TO SHORT TERM STORAGE AT 37 DEG C. PARAMETERS WILL THEN BE INVESTIGATED THAT AFFECT LYOPHILIZATION OF SELECTED UREASE- ANTIBODY CONJUGATES, AND THEIR STABILITY TO SHORT TERM STORAGE AT 60 DEG C. IT IS PROPOSED THAT ONE MONOCLONAL AND ONE POLYCLONAL MODEL SYSTEM ANTIBODY BE STUDIED. THE DATA OBTAINED FROM THESE PHASE I STUDIES WILL PROVIDE VALUABLE INFORMATION ON PROMISING AVENUES OF APPROACH FOR PHASE II, WHEN FURTHER REFINEMENTS WILL ENABLE PRODUCTION OF HIGH ACTIVITY, STABLE CONJUGATES, FOR USE IN U.S. ARMY APPLICATIONS OF THE THRESHOLD SYSTEM.

STC - DIAGNOSTICS
115 RESEARCH DR - BLDG F
BETHLEHEM, PA 18015
Program Manager: DR SAM NIEDBALA
Contract #:
Title: IMMUNOASSAY CONJUGATES STABILIZATION FOR FIELD STORAGE CONDITIONS
Topic #: A90-256 Office: CRDEC ID #: 41995

A COMMERCIALLY AVAILABLE BIOSENSOR INCLUDES SEVERAL PROTEIN COMPONENTS THAT ARE CRITICAL TO THE PERFORMANCE OF THE DEVICE. THESE PROTEINS ARE UNSTABLE UNLESS THEY ARE REFRIGERATED. SOME OF THE PROTEINS INVOLVED INCLUDE UREASE CONJUGATES, AS WELL AS BIOTIN, AVIDIN, AND ANTIBODIES. IF THIS TECHNOLOGY IS TO HAVE PRACTICAL USE TO THE MILITARY, IT MUST WITHSTAND EXTREME TEMPERATURES FOR LONG PERIODS OF TIME. STC DIAGNOSTICS PROPOSES SEVERAL METHODS TO STABILIZE THESE PROTEINS. THIS INCLUDES THE USE OF SURFACTANTS, SOLVENTS, PROTEIN STABILIZERS, ENZYME INHIBITORS, AND MICRO- ENCAPSULATION. BY THE END OF PHASE I, ONE OR MORE METHODS TO INCREASE THE STABILITY OF THESE PROTEINS SHOULD BE ACHIEVED. PHASE II WORK WOULD THEN FOCUS ON THESE STABILIZATION METHODS AND BRING THEM INTO PRACTICAL USE.

NEW EAGLE COMMUNICATIONS GP INC
201 RAILROAD ST
SILVER LAKE, KS 66539
Program Manager: DAVID W LANDIS
Contract #:
Title: POTENTIAL MICROPHONE MANUFACTURERS FOR NBC PROTECTIVE MASK
Topic #: A90-257 Office: CRDEC ID #: 41996

THIS EXPLORATORY DEVELOPMENT'S GOAL IS TO PINPOINT SOURCES AND MANUFACTURERS OF STATE-OF-THE-ART MICROPHONE TO BE USED IN THE U.S. ARMY NBC PROTECTIVE MASK BY COMPLETING THE FOLLOWING OBJECTIVES: 1) NEEDS ASSESSMENT: 1. END USER, 2. DESIGNERS, 3. MATERIALS. 2) RESEARCH FOR ADVANCED TECHNOLOGY MICROPHONES. 3) IDENTIFICATION OF ALL POTENTIAL MICROPHONES FOR NBC PROTECTIVE MASKS INCLUDING: 1. DISCOVERED PROCESSES, TECHNOLOGIES, OR STUDIES THAT MAY BE RELEVANT TO GRANTOR FOR PHASE II.

SPHINX TECHNOLOGIES INC
PO BOX 81287
WELLELEY HILLS, MA 02181
Program Manager: JOHN H SANGSTER

Contract #:
Title: ADVANCED TECHNOLOGY MICROPHONE FOR NBC PROTECTIVE MASKS
Topic #: A90-257 Office: CRDCE ID #: 41997

THE MICROPHONES CURRENTLY USED IN ARMY NBC PROTECTIVE MASKS ARE RELATIVELY LARGE, BULKY, HEAVY DYNAMIC MICROPHONES DESIGNED MANY YEARS AGO. THE ARMY SEEKS AN IMPROVED MICROPHONE WHICH IS MUCH SMALLER AND LIGHTER THAN THE CURRENT DESIGNS AND WHICH OFFERS INCREASED INTELLIGIBILITY. THOUGH NOT SPECIFICALLY MENTIONED, RUGGEDNESS, RELIABILITY AND LONG-TERM SHELF LIFE ARE ADDITIONAL REQUIREMENTS. THIS PROJECT ADDRESSES THE TASK OF FINDING, INSOFAR AS POSSIBLE, THE BEST AND MOST APPROPRIATE MICROPHONE TECHNOLOGY FOR UPGRADING THE NBC PROTECTIVE MASK TO MEET THESE NEEDS AND TO TAKE ADVANTAGE OF RECENT ADVANCES IN TECHNOLOGY. THE PROJECT WILL CONSIDER NOT ONLY EXISTING MICROPHONE PRODUCTS OF RECENT AND ADVANCED DESIGN, BUT ALSO OPPORTUNITIES FOR IMPROVING ON EXISTING DESIGNS EITHER BY ATTENTION TO DETAIL OR BY INTRODUCING ENTIRELY NEW MICROPHONE TRANSDUCER PRINCIPLES WHICH UTILIZE CONTEMPORARY TECHNOLOGY IN A NEW WAY. SPHINX TECHNOLOGIES AND ITS SUBCONTRACTOR, DOVE ELECTRONICS, HAVE SEVERAL SPECIFIC CONCEPTS OF THE LATTER SORT TO OFFER, WHICH ARE CONSIDERED PROPRIETARY AND ARE DISCUSSED IN SOME DETAIL IN THE MAIN BODY OF THE PROPOSAL. THE PHASE I STUDY WILL CONSIDER ALL REASONABLE POSSIBILITIES FOR THE UPGRADE, BUT WILL QUICKLY NARROW THEM DOWN TO A SMALL SET OF MOST PROMISING CANDIDATES. THESE WILL THEN BE STUDIED IN DEPTH TO PROVIDE A FOCUSED AND TECHNICALLY SOUND PLAN OF ATTACK FOR SUBSEQUENT EXPLORATORY DEVELOPMENT OF ADVANCED TECHNOLOGY MICROPHONE PROTOTYPES IN PHASE II.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821
Program Manager: FRANK J IANNARILLI JR
Contract #:
Title: MODEL BASED SYNTHETIC DISCRIMINANT FUNCTIONS FOR PATTERN RECOGNITION
Topic #: A90-260 Office: MICOM ID #: 41999

THE SYNTHETIC DISCRIMINANT FUNCTION (SDF) OFFERS REAL TIME DISCRIMINATION OF HIGH-VALUE TARGETS FROM OTHER OBJECTS AND CLUTTER. GIVEN THE ARMY MICOM MISSION, SDFs PROMISE GREATER PERFORMANCE OVER RETICLE-BASEDOR SIMPLER IMAGING SEEKER DESIGNS. AN SDF MUST BOTH DISCRIMINATE EFFECTIVELY AND LOCATE TARGET (CENTROID) POSITION ACCURATELY. JOINT OPTIMIZATION OF THESE TWO OBJECTIVES WILL BE EXPLORED BY TESTING THREE TYPES OF SDFs. THE SYNTHESIS OF THESE SDFs WILL BE FROM MODEL GENERATED IMAGE VECTORS, RATHER THAN FROM FIELD DATA. THE PHASE I VALIDATION OF THE MODEL BASED APPROACH TO SDF SYNTHESIS WILL MOTIVATE FOLLOW-ON EFFORTS TO EXPLOIT ITS MAJOR ADVANTAGES. THE USE OF A SYNTHETIC TARGET IMAGE GENERATION MODEL, E.G., AERODYNE'S SPIRITS AS THE FOUNDATION OF MODEL BASED SDF SYNTHESIS WOULD ALLOW GENERATION OF TRAINING VECTORS FOR ARBITRARY ASPECT, RANGE, ILLUMINATION, AND TARGET OPERATING CONDITION. THIS ENABLES GENERATION OF AN OPTIMAL REPRESENTATIVE TRAINING SET, ELIMINATING THE NEED TO ACQUIRE COSTLY MEASURED TARGET DATA VECTORS. SUCH MODEL WOULD BE COUPLED WITH A PROPOSED OPTIMAL TRAINING VECTOR SELECTION TECHNIQUE, USING TRADITIONAL METHODS OR MASSIVELY PARALLEL HOPFIELD NEURAL NETWORKS TO SOLVE AN EQUIVALENT GRAPH BIPARTITIONING PROBLEM. THE TECHNIQUE IS PARTICULARLY EFFECTIVE FOR LARGE SETS OF CANDIDATE VECTORS.

APPLIED RESEARCH INC
PO BOX 11220
HUNTSVILLE, AL 35814
Program Manager: LARRY Z KENNEDY
Contract #:

Title: MODEL BASED SYNTHETIC DISCRIMINANT FUNCTION FOR PATTERN RECOGNITION
Topic #: A90-260 Office: MICOM ID #: 41998

THIS IS A PROPOSAL TO APPLY A TARGET MODEL IN THE DEVELOPMENT OF GENERALIZED SDF FILTERS FOR AUTOMATIC TARGET RECOGNITION. METHODOLOGY WILL BE DEVELOPED, SDF ALGORITHMS AND TARGET MODEL REQUIREMENTS WILL BE EVALUATED FOR THIS PURPOSE.

TAYLOR S R & ASSOCS
516 SW KAW
BARTLESVILLE, OK 74003
Program Manager: DR SCOTT R TAYLOR
Contract #:
Title: LOW COST NON-AUTOCLAVE PROCESSING OF ULTRAHIGH-MODULUS CARBON FIBER THERMOPLASTIC COMPOSITES
Topic #: A90-261 Office: MICOM ID #: 42000

VERY RECENTLY, THERMOPLASTIC PULTRUSIONS, INC., HAS DEVELOPED THE CAPABILITY TO PULTRUDE ULTRA HIGH-MODULUS GRAPHITE FIBER/POWDERED THERMOPLASTIC RESIN PREPREGS INTO HIGH QUALITY COMPOSITES WITHOUT DAMAGING THE FIBERS. SINCE THE PULTRUDED COMPOSITES ARE ALREADY CONSOLIDATED, REFORMING DOES NOT REQUIRE THE HIGH PRESSURES AND LONG DURATIONS TYPICAL OF AUTOCLAVE FABRICATION. HENCE, IT SHOULD BE POSSIBLE TO LAYUP A COMPONENT FROM PULTRUDED STOCK MATERIALS ONTO A MANDREL WHICH WOULD FIT INSIDE ANOTHER METAL SHELL. THE KEY WILL BE TO MAKE THE INNER AND OUTER MANDRELS OUT OF MATERIALS HAVING DIFFERENT COEFFICIENTS OF THERMAL EXPANSION. BY HAVING AN INNER MANDREL THAT CAN EXPAND MORE THAN THE EXTERNAL SHELL, VIRTUALLY ANY PRESSURE COULD BE EXERTED ON THE COMPOSITE SANDWICHED IN BETWEEN IN AN INEXPENSIVE OVEN. THE GOAL OF THE PROPOSED PROJECT WILL BE TO UTILIZE THE UNIQUE REFORMING PROPERTIES OF THERMOPLASTIC COMPOSITES TO ALLOW SIMPLE FABRICATION OF HIGH-MODULUS HIGH-STRENGTH TUBULAR COMPOSITE COMPONENTS VIA THIS NOVEL DIFFERENTIAL THERMAL EXPANSION (DTE) PROCESS.

ASPEN SYSTEMS INC
184 CEDAR HILL ST
MARLBOROUGH, MA 01752
Program Manager: DR MICHAEL M TILLEMAN
Contract #:
Title: PROBE FOR FLUCTUATING TEMPERATURE MEASUREMENTS IN TURBULENT SUPERSONIC FLOWS
Topic #: A90-262 Office: MICOM ID #: 42001

AN INNOVATIVE COHERENT OPTICAL MEASUREMENT METHOD TO DIAGNOSE HIGH FREQUENCY FLUCTUATING COMPONENTS IN A HIGH MACH NUMBER FLOW IS PROPOSED. THE SPECIES CONCENTRATION, STATIC AND STAGNATION TEMPERATURE OF THE GAS MIXTURE, WILL BE MEASURED DIRECTLY AND SIMULTANEOUSLY DURING A SINGLE LASER PULSE, DURING ABOUT 10 nsec. THIS MAKES THE MEASUREMENT COMPATIBLE WITH HIGH FREQUENCY TURBULENT REGIMES. THE PRESSURE (STATIC AND STAGNATION) AS WELL AS THE VELOCITY WILL BE DETERMINED BY THE MEASURED DATA. OTHER ATTRACTIVE AND UNIQUE PROPERTIES OF THE PROPOSED APPARATUS INCLUDE A SPATIAL RESOLUTION OF ABOUT 10 MICRONS, AND A MEASUREMENT SENSITIVITY EQUIVALENT TO A PARTIAL PRESSURE OF LESS THAN 1 MILLITORR OF MOLECULAR NITROGEN. THE PROPOSED SYSTEM OPERATES BY A NOVEL COHERENT SCATTERING METHOD, THAT PROVIDES CONSIDERABLE ADVANTAGES OVER EXISTING SCATTERING TECHNIQUES. THE MULTIPLE MEASUREMENT USING A SINGLE APPARATUS IS POSIBLE DUE TO THE TUNABILITY OF THE COHERENT SOURCE AS WELL AS THE CONVOLUTED INFORMATION OBTAINED IN THE OUTPUT SIGNAL. THE PROPOSED LABORATORY SETUP WILL INCLUDE A NOVEL SINGLE LASER INVENTED BY THE PRINCIPAL INVESTIGATOR, SO THAT NO ADDITIONAL COHERENT RADIATION SOURCES ARE

NECESSARY.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
Program Manager: KENNETH E WILLIS
Contract #:
Title: PROGRAMMABLE FIELD OF REGARD OPTICAL PROXIMITY FUZE
Topic #: A90-263 Office: MICOM ID #: 42002

THIS PROPOSAL ADDRESSES A SOLUTION TO THE PROBLEM OF PROVIDING A TARGET DETECTION DEVICE WHICH CAN SUPPORT A DIRECTIONAL, FRAGMENTATION ANTI-AIR WARHEAD. THE BASIC ARCHITECTURE IS DEFINED IN THE MICOM TECHNICAL REPORT RD-AS-89-18. THE DIODE LASER PROXIMITY SENSOR IS BASED ON A DESIGN CURRENTLY UNDER DEVELOPMENT AT QUANTIC. THE INTEGRATION OF THESE TWO CONCEPTS CAN RESULT IN A PRODUCIBLE, PROGRAMMABLE FIELD OF REGARD OPTICAL PROXIMITY FUZE FOR AIR DEFENSE APPLICATIONS.

SCHWARTZ ELECTRO-OPTICS INC
3404 N ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Program Manager: ROBERT A OLSON
Contract #:
Title: PROGRAMMABLE FIELD OF REGARD OPTICAL PROXIMITY FUZE
Topic #: A90-263 Office: MICOM ID #: 42003

TECHNICAL REPORT RD-AS-89-18 DEVELOPED A NEW OPTICAL CONFIGURATION FOR AN AIR-DEFENSE OR ANTI-MISSILE PROXIMITY FUZE WHICH PERMITS A VARIABLE FIELD OF REGARD TO BE USED. THE SENSING FIELD IS PROGRAM- ABLE IN BOTH SHAPE AND POINTING ANGLE, CONTROLLED BY THE POSITION AND TILT OF A MULTICHANNEL IR LASER SENSOR INSIDE A HEMISPHERICAL- CAVITY OPTIC. THIS HAS THE POTENTIAL TO PERMIT IN-FLIGHT FUZE OPTIMIZATION FOR THE EMERGING TECHNOLOGY OF AIMABLE WARHEADS. THIS EFFORT SEEKS TO INVESTIGATE AND REFINE THE CONCEPT OF HEMISPERHICAL- CAVITY OPTICS AS APPLIED TO ADAPTABLE-GEOMETRY PROXIMITY FUZE TECHNOLOGY. THE OBJECTIVES OF THIS PROGRAM INCLUDE LABORATORY EXPERIMENTS INTENDED TO VALIDATE THE PIECE-WISE PRISMATIC APPROXIMATION USED IN THE PRELIMINARY ANALYSIS. RANGE EQUATIONS WILL BE DEVELOPED WHICH WILL PREDICT SIGNAL TO NOISE RATIOS FOR A VARIETY OF LASER SENSOR SYSTEM APPROACHES, INCLUDING CW, PULSED, PARALLEL AND MULTIPLEXTED MULTICHANNEL SYSTEMS.

MALIBU RESEARCH ASSOCS
26670 AGOURA RD
CALABASAS, CA 91302
Program Manager: DR GERALD E POLLON
Contract #:
Title: COHERENT FEED FOR SPATIALLY DISTRIBUTED 94 GHz ARRAY USING A PASSIVE PHASED SURFACE
Topic #: A90-264 Office: MICOM ID #: 42004

MALIBU RESEARCH HAS RECENTLY DEVELOPED A FLAPS PHASED-SURFACE TECHNIQUE FOR CONSTRUCTION OF THIN ELECTROMAGNETIC STRUCTURES HAVING THE CAPABILITY OF SCATTERING INCIDENT RF ENERGY IN SPECIFIC PREFERRED DIRECTIONS AND PATTERNS. THE DESIGN IS BASED ON ARRAYS OF PRINTED CIRCUIT DIPOLES. TO DATE WE HAVE USED THIS TECHNIQUE FOR CONSTRUCTION OF ANTENNAS AND CONFORMAL REFLECTORS. THIS TECHNIQUE IS IDEALLY SUITED FOR GENERATION OF RELIABLE, COST-EFFECTIVE 94 GHz COHERENT TARGET SCENARIOS FOR MISSILE SEEKER TEST AND EVALUATION. RATHER THAN A MATRIX OF ANTENNAS THE TARGET FOV WALL (60 DEG X 10 DEG AT 15

METERS) IS COVERED WITH THE FLAPS SURFACE AND EXCITED BY AN 18" ILLUMINATION ANTENNA. THE SURFACE HAS THE PROPERTY THAT NO MATTER WHERE THE ILLUMINATION SPOT STRIKES IT, IT REFOCUSES THE INCIDENT 94 GHz BACK TOWARDS THE TEST SEEKER POSITION. MOTION OF THE ILLUMINATING BEAM SPOT CARVES OUT THE DESIRED TARGET TRAJECTORY IN A CONTINUOUS (< 1 mr) MANNER. OTHER PROPERTIES ARE LOW LOSSES, HIGH BANDWIDTH AND EASY MULTIPLE POLARIZATION CAPABILITY. UNDER THE PROPOSAL PROJECT A DESIGN FOR THE SPECIFICS OF SUCH A COHERENT, SPATIALLY DISTRIBUTED 94 GHz TARGET SCENARIO GENERATOR, BASED ON THIS CONCEPT WOULD BE CARRIED OUT.

TECHNOLOGY DEVELOPMENT ASSOCS INC
992 OLD EAGLE SCHOOL RD - STE 910
WAYNE, PA 19087
Program Manager: RICHARD C FOEDINGER
Contract #:
Title: DESIGN CONCEPTS FOR COMPOSITE MOTORCASE TO END CLOSURE ATTACHMENT
Topic #: A90-265 Office: MICOM ID #: 42005

CURRENT METHODS FOR ATTACHING END CLOSURES TO COMPOSITE MOTORCASES WITH FULL DIAMETER OPENINGS MOST FREQUENTLY UTILIZE MECHANIAL PIN OR KEY JOINTS REQUIRING ADDITIONAL WEIGHT AT THE JOINT AREA AND EXPENSIVE, TIME-CONSUMING MACHINING OPERATIONS. MORE EFFICIENT METHODS OF JOINING END CLOSURES TO COMPOSITE MOTORCASES ARE REQUIRED TO FULLY REALIZE THE WEIGHT ADVANTAGES AND PERFORMANCE IMPROVEMENTS OFFERED BY COMPOSITE MOTORCASES. THE PROPOSED PHASE I RESEARCH WILL IDENTIFY SEVERAL DESIGN CONCEPTS FOR SMALL DIAMETER COMPOSITE ROCKET MOTORCASE-TO-END CLOSURE JOINTS WHICH OFFER IMPROVED EFFICIENCY OVER CURRENT MECHANICAL ATTACHMENT CONCEPTS. THE IMPACT OF TYPICAL TACTICAL MOTOR REQUIREMENTS ON COMPOSITE CASE/END CLOSURE DESIGN PHILOSOPHY WILL ALSO BE EVALUATED AS PART OF THE PHASE I ACTIVITY TO ALLOW FOR GREATER DESIGN FLEXIBILITY. IN ADDITION TO INTEGRALLY WOUND ATTACHMENTS AND ADHESIVELY BONDED THERMOPLASTIC JOINT CONCEPTS FOR FULL DIAMETER OPENING MOTORCASES, THE PROPOSED RESEARCH WILL ALSO EVALUATE THE FEASIBILITY OF FILAMENT WOUND DOMES/CLOSURES, REVERSE DOMES/CLOSURES AND MONOPOLE CASE DESIGNS, CONSISTENT WITH IDENTIFIED SYSTEM AND MOTOR REQUIREMENTS. THE PHASE I PROGRAM WILL RESULT IN THE SELECTION OF THE THREE MOST PROMISING DESIGN CONCEPTS FOR SUBSEQUENT EVALUATION AND TESTING IN PHASE II.

PHYSICAL OPTICS CORP
20600 GRAMERCY PL - STE 103
TORRANCE, CA 90501
Program Manager: DR WILLIAM LIU
Contract #:
Title: RESONANCE INTERFEROMETRIC FIBER OPTICAL GYRO FOR HIGH-G ENVIRONMENT
Topic #: A90-266 Office: MICOM ID #: 42006

THE OPTICAL RATE SENSOR, ESPECIALLY THE INTERFEROMETRIC FIBER OPTICAL GYRO (IFOG) SYSTEM HAS THE QUALITIES TO PERFORM THROUGH HIGH-G SHOCK ENVIRONMENT. HOWEVER, ITS HIGH COST HAS MADE ITS USE IN MANY LOW COST SMART WEAPONS IMPRACTICAL. IN ORDER TO REDUCE THE COST OF IFOGs, MATERIAL COSTS MUST BE REDUCED DRAMATICALLY AND THE MANUFACTURING METHODOLOGY MUST BE IMPROVED. PHYSICAL OPTICS CORPORATION (POC) PROPOSES TO MANUFACTURE A VARIANT (ALSO CALLED THE RESONANCE INTERFEROMETRIC FIBER OPTICAL GYRO [RIFOG]) OF THE CONVENTIONAL IFOG WHICH REUSES THE ROTATION SENSING FIBER HUNDREDS OF TIMES, THEREFORE REDUCING THE FIBER LENGTH REQUIREMENT OF EXPENSIVE FIBER BY A FACTOR OF A FEW HUNDRED. THE SUPPORTING INTEGRATED OPTICAL CIRCUITRY WILL ALSO BE MANUFACTURED IN INEXPENSIVE SODA LIME GLASS INSTEAD OF EXOTIC ELECTRO-OPTIC MATERIALS. HOLO- GRAPHIC GRATING COUPLERS WILL BE USED ON THE TOP SURFACE OF THE OPTICAL CIRCUIT SUBSTRATE SO THE END-FIRING INPUT COUPLING SCHEME

WITH A HIGH FAILURE RATE WILL BE ELIMINATED. THE RIFOG WILL HAVE SIGNIFICANTLY FEWER MAJOR COMPONENTS. WITH THE ADVANCED REAL TIME INTEGRATION MONITORING SCHEME, THE COST OF HIGHLY AUTOMATED, FINAL ASSEMBLY OF THE RIFOG WILL BE REDUCED SIGNFICANTLY. IN ADDITION TO ITS LOW COST AND RESISTANCE TO HIGH-G SHOCK, THE RIFOG HAS A WIDE COST/PERFORMANCE RANGE SO IT IS SUITABLE FOR APPLICATIONS RANGING FROM JET AIRCRAFT GUIDANCE SYSTEMS TO DISPOSAL SMART WEAPON INERTIAL MEASUREMENT UNITS.

KNIGHTRONIX INC
2105 MISSISSIPPI CIR
NEW BRIGHTON, MN 55112
Program Manager: ARNOLD W KNIGHT
Contract #:
Title: HIGH SPEED HIGH RESOLUTION CORRELATOR
Topic #: A90-267 Office: MICOM ID #: 42007

THERE IS A NEED FOR A HIGH SPEED, HIGH RESOLUTION CORRELATION SYSTEM FOR TARGET TRACKING, WHICH IS COST EFFECTIVE, AND FIELDABLE FOR USE ON THE FORWARD AREA AIR DEFENSE (FAAD) SYSTEM. SUCH A TRACKER SHALL BE CAPABLE OF OPERATING AT HIGHER THAN NORMAL TV RATES, TO PROVIDE THE NECESSARY DYNAMIC TRACKING ACCURACY AND ACCOMODATE TARGET SIZE AND ROTATIONAL CHANGES. THE PROGRAM EFFORT IS TO DEVELOP A CUSTOM, PARALLEL CORRELATOR, WHICH WILL EASILY OPERATE AT 300 FRAMES/SECOND OR MORE, PROCESSING A PIXEL AREA OF GREATER THAN 50 X 50 PIXELS. THE PHASE I EFFORT WILL DEFINE THE PRELIMINARY DESIGN AND INCLUDE A BREADBOARD DEMONSTRATION UNIT TO SHOW CONCEPT FEASIBILITY OF THE PROCESSOR.

ADVANCED MOTION CONTROLS INC
PO BOX 379
PRINCETON, WI 54968
Program Manager: GEORGE H HOLLING
Contract #:
Title: INTEGRAL STARTER/GENERATOR FOR SMALL TURBO JET ENGINES
Topic #: A90-268 Office: MICOM ID #: 42008

THE PROPOSED EFFORT WILL DEVELOP AN INTEGRAL STARTER/GENERATOR FOR SMALL TURBO JET ENGINES. THE STARTER CAN BE POWERED BY A 28 VDC BATTERY. THE LENGTH OF THE STARTER WILL BE 2.5 - 3" AND THE O.D. WILL BE 2.5". THE STARTER WILL BE ABLE TO GENERATE 190 OZ-IN OF PEAK TORQUE TO ACCELERATE THE TURBINE TO 50 KRPM. AFTER THE ENGINE RUNS ABOVE SUSTAINING SPEED THE ELECTRONIC CONTROL WILL SWITCH FROM THE STARTER MODE INTO THE GENERATOR MODE. THE UNIT WILL THEN DEVELOP UP TO 1 KW OF REGULATED 28 VDC POWER. THE STARTER/GENERATOR IS A BRUSHLESS HYBRID MOTOR DESIGN. RARE EARTH MAGNETS WILL BE USED TO DEVELOP SUFFICIENT POWER IN THE GIVEN PACKAGE SIZE. PROPRIETARY DESIGN TECHNIQUES ARE USED FOR THE BRUSHLESS MOTOR AND THE ASSOCIATED CONTROL ELECTRONICS TO MINIMIZE THE POWER CONSUMPTION DURING START AND TO MAXIMIZE EFFICIENCY WHEN OPERATING AS A GENERATOR TO MINIMIZE THE FLIGHT PERFORMANCE LOSS OF THE TURBINE ENGINE.

TECHNICAL DIRECTIONS INC
1210 OAKBROOK DR
ORTONVILLE, MI 48462
Program Manager: VERN E BROOKS
Contract #:
Title: FEASIBILITY DEMONSTRATION OF LOW COST INTEGRAL STARTER/GENERATOR FOR SMALL TURBOJET
Topic #: A90-268 Office: MICOM ID #: 42009

AN OPERATIONAL DEMONSTRATION OF THE TECHNICAL FEASIBILITY OF A LOW COST INTEGRAL STARTER/GENERATOR FOR SMALL TURBOJET ENGINES IS PROVIDED BY THIS PROGRAM. A UNIQUE DUAL PURPOSE STARTER/GENERATOR CONTROL CONCEPT IS EMPLOYED WHICH USES ONLY ONE-THIRD OF THE POWER SWITCHING DEVICES OF CONVENTIONAL SYSTEMS. THIS NEW CONTROL CONCEPT WILL SIGNIFICANTLY REDUCE THE COST OF THE OVERALL STARTER/GENERATOR INSTALLATION. THIS EXPLORATORY DEVELOPMENT PROGRAM WILL CONSTRUCT A PROTOTYPE STARTER/GENERATOR AND EVALUATE ITS PERFORMANCE DIRECTLY COUPLED TO A SMALL TURBINE ENGINE. THE DEVELOPMENT HARDWARE WILL BE CONSTRUCTED FROM AS MANY EXISTING COMPONENTS AS POSSIBLE TO PROVIDE THE NECESSARY TECHNICAL RESULTS WITHIN THE TIME AND COST LIMITATIONS OF THE PHASE I PROGRAM. THIS PROGRAM WILL FOCUS ON THE CRITICAL COMPONENTS TO THE SUCCESS OF THIS SYSTEM CONCEPT IN ORDER TO ADDRESS THE AREAS OF MAJOR TECHNICAL RISK. TEST DATA WILL BE OBTAINED ON THE CRANKING LOADS OF SMALL TURBINE ENGINES TO PERMIT THE SCALING OF THE STARTER/GENERATOR SYSTEM TO LARGER UNITS IN THE NEXT PHASE OF THE PROGRAM.

IDA RESEARCH INC
12421 W 49TH AVE - #6
WHEAT RIDGE, CO 80033
Program Manager: WILLIAM L BELL
Contract #:
Title: APPLICATIONS OF NEW CHEMICAL HEAT SOURCES
Topic #: A90-269 Office: NATICK ID #: 42010

CHEMICAL HEAT SOURCES HAVE MANY POTENTIAL MILITARY APPLICATIONS. FOR EXAMPLE, AN ELECTROCHEMICAL CELL HAS BEEN DEVELOPED AS A FLAMELESS RATION HEATER. THE OBJECTIVE OF THE PROPOSED WORK IS (1) TO IDENTIFY NEW CHEMICAL HEAT SOURCES AND POTENTIAL APPLICATIONS, AND (2) TO CONDUCT A SYSTEMS ANALYSIS TO DETERMINE THE VALUE OF THE NEW APPROACHES. WE HAVE IDENTIFIED THREE GENERAL AREAS OF CHEMICAL HEAT SOURCES AND POTENTIAL APPLICATIONS WHICH WILL BE INVESTIGATED. THESE SOURCES ARE: AN ELECTROCHEMICAL CELL WITH HIGH ENERGY DENSITY THAT CAN PRODUCE A CONTROLLED HEAT OUTPUT. APPLICATIONS INCLUDE HEATERS FOR FOOD OR WATER, BLOOD OR SIMILAR MEDICAL SUPPLIES, BOOTS OR GLOVES, AND PORTABLE COMMUNICATIONS EQUIPMENT. EXOTHERMIC REACTION OF A METAL WITH WATER. A NOVEL METHOD OF CONTROLLING THE RATE OF THIS REACTION IS DESCRIBED. APPLICATIONS INCLUDE HEATING WATER FOR DRINKING OR WASHING, AND HEATING BATTERIES OR EQUIPMENT. CONTROLLED COMBUSTION OF HYDROCARBON FUELS FOR INFRARED DECOYS TO SIMULATE VEHICLES. TWO DISTINCT APPROACHES ARE DESCRIBED FOR A LOW-COST, LIGHTWEIGHT DECOY WHICH USES MINIMAL FUEL TO GENERATE THE APPROPRIATE HEAT SIGNATURE AND DOES NOT EMIT VISIBLE LIGHT. FOR THE PROMISING NOVEL HEAT SOURCES IDENTIFIED IN PHASE I, WORK IN PHASE II WILL DESIGN, CONSTRUCT, AND TEST PROTOTYPE DEVICES.

SALK INSTITUTE BIOTECHNOLOGY
505 COAST BLVD S
LaJOLLA, CA 92037
Program Manager: RICHARD G BUCKHOLZ
Contract #:
Title: RECOMBINANT EXPRESSION OF SPIDER SILK PROTEIN IN PICHIA PASTORIS
Topic #: A90-270 Office: NATICK ID #: 42011

THIS PHASE I PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT OF AN EXPRESSION SYSTEM FOR THE HIGH LEVEL SYNTHESIS OF RECOMBINANT FIBROUS PROTEINS IN THE METHYLOTROPHIC YEAST, PICHIA PASTORIS. THE ULTIMATE OBJECTIVE IS A PRODUCTION SYSTEM WHICH PROVIDES HIGH LEVELS OF A RECOMBINANT, SPIDER SILK PROTEIN THAT MAY BE READILY ISOLATED WITH MINIMAL COST, AND WHICH MAY BE SCALED UP WITH MAXIMUM YIELDS OF PRODUCT. DURING THIS DEVELOPMENT PROGRAM, OUR RESEARCH WILL FOCUS ON FOUR PRIMARY AREAS: 1) THE STABILITY OF THE HETEROLOGOUS SPIDER SILK GENE IN THE PICHIA PASTORIS HOST, 2) THE LEVELS OF EXPRESSION FOR SECRETED AND CYTOPLASMIC

MODES OF EXPRESSION, 3) THE YIELDS OF PRODUCT FROM ONE-LITER FERMENTORS, AND 4) THE STABILITY AND STRUCTURE OF THE RECOMBINANT PROTEIN.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR LAWRENCE DOMASH
Contract #:
Title: ANOFA: DEVICE FOR LASER EYE PROTECTION
Topic #: A90-271 Office: NATICK ID #: 42012

PROTECTION OF SOLDIER'S EYES FROM LASER HAZARDS TO FREQUENCY AGILE PULSED LASERS IS AN UNSOLVED PROBLEM. THE PROPOSED PHASE I RESEARCH WILL DETERMINE THE FEASIBILITY OF A NOVEL IMAGE INTENSITY- THRESHOLDING DEVICE CALLED ANOFA (ACTIVE NONLINEAR OPTICAL FIBER ARRAY). RECENT FOSTER-MILLER RESEARCH HAS DEMONSTRATED NONLINEAR OPTICAL LIMITING AT THE PICOSECOND LEVEL USING OPTICAL FIBERS COMBINED WITH ORGANIC NLO LIQUIDS. ANOFA EXTENDS THIS CONCEPT OF 2D FIBER OPTIC IMAGING ARRAYS. PHASE I RESEARCH WILL EVALUATE A NUMBER OF ALTERNATIVE STRUCTURES AND NONLINEAR MATERIALS FOR INCORPORATION IN ANOFA AND TEST THE RESULTING STRUCTURE FOR ENHANCED OPTICAL NONLINEARITY. PHASE II RESEARCH WILL CONSTRUCT AND DEMONSTRATE A FUNCTIONAL OPTICAL INTENSITY LIMITER WITH A GEOMETRY SUITABLE FOR INCORPORATION IN HEADGEAR OPTICAL SYSTEM. ANOFA TECHNOLOGY MAY YIELD AN ENTIRE FAMILY OF LASER PROTECTION DEVICES, POTENTIALLY APPLICABLE TO A WIDE RANGE OF SENSOR OR PERSONNEL VIEWING SYSTEMS. RESPONSE TIMES OF A FEW ps, INTENSITY THRESHOLDS ON THE ORDER OF 1 W/cm(2), IMAGE ATTENUATION ON THE ORDER OF 3 dB IN NORMAL USE AND WAVELENGTH RESPONSE THROUGHOUT THE VISIBLE AND NEAR IR APPEAR TO BE POSSIBLE.

YANKEE SCIENTIFIC INC
200 BUTTERFIELD DR
ASHLAND, MA 01721
Program Manager: DR ERIC C GUYER
Contract #:
Title: DIESEL-FUELED REFRIGERATION FOR NON-POWERED FIELD KITCHENS
Topic #: A90-272 Office: NATICK ID #: 42013

THE DESIGN AND TEST OF A DOWN-DRAFT WICK AND PLATE DIESEL FUEL BURNER IS PROPOSED TO MEET THE NEED FOR A CLEAN-BURNING, SMOKE-FREE, LOW- OR NO-POWER HEAT SOURCE TO OPERATE AN AMMONIA/WATER CYCLE FIELD KITCHEN REFRIGERATION UNIT. THE DOWN-DRAFT WICK AND PLATE BURNER DESIGN IS AN EXTREMELY SIMPLE DESIGN CONCEPT THAT GREW OUT STUDIED OF POTENTIAL IMPROVEMENTS TO THE M67 STANDARD US ARMY IMMERSION HEATER THAT WERE UNDERTAKEN IN 1981. THE KEY FUNCTIONAL CHARACTERISTICS OF THIS BURNER DESIGN HAVE BEEN DEMONSTRATED IN THIS RELATED APPLICATION. THE PROPOSED PROJECT WILL BUILD UPON THIS EXPERIENCE BASE. THE PROJECT WILL INVOLVE THE DESIGN AND TEST OF A DEVICE THAT IS COMPOSED OF INEXPENSIVE AND EASILY-SERVICED COMPONENTS AND THAT HAS A HIGH PROBABILITY OF MEETING ALL ARMY REQUIREMENTS FOR A LOW-FIRING RATE DIESEL BURNER HEAT SOURCE FOR REFRIGERATION UNITS IN NON-POWERED FIELD KITCHENS.

MAINSTREAM ENGINEERING CORP
200 YELLOW PL - PINES INDUSTRIAL CTR
ROCKLEDGE, FL 32955
Program Manager: DR ROBERT P SCARINGE
Contract #:
Title: DEVELOPMENT OF AN AIR CYCLE MICRO-CLIMATE COOLING DEVICE

Topic #: A90-273 Office: NATICK ID #: 42014

FUTURE ARMY COMBAT MISSIONS WILL INTRODUCE SIGNIFICANT NEW TECHNOLOGICAL NEEDS FOR THE FOOT SOLDIER. HEAT-PUMP-COOLED PROTECTIVE CLOTHING WILL BE NECESSARY TO ALLOW EXTENDED USE OF PROTECTIVE GARMENTS WITHOUT EXCESSIVE FATIGUE. THE INTENT OF THIS PROPOSAL IS TO INVESTIGATE A NOVEL, LIGHTWEIGHT, OPEN-CYCLE, REVERSE BRAYTON HEAT PUMP FOR PERSONAL COOLING IN A BACKPACK CONFIGURATION. THE PROPOSED DESIGN EMPLOYS A SMALL, LIGHTWEIGHT, HIGH-SPEED CENTRIFUGAL COMPRESSOR/EXPANDER AND INNOVATIVE HEAT EXCHANGER AND IS LIGHTER AND MORE EFFICIENT THAN TRADITIONAL REVERSE BRAYTON METHODS. THIS INNOVATIVE SYSTEM USES AN AMBIENT AIR WORKING FLUID AND COULD ACCOMMODATE BATTLEFIELD FUELS SUCH AS JP-8 FUEL AS THE ENERGY SOURCE. OTHER FUEL SOURCES ARE EASILY ACCOMMODATED. AUXILIARY ELECTRIC POWER WILL ALSO BE GENERATED TO PROVIDE ELECTRICAL ENERGY FOR THE ELECTRONICS THAT THE SOLDIER IS ANTICIPATED TO BE WEARING.

MOLECULAR TECHNOLOGIES INC
145 MOORE ST
LOWELL, MA 01852
Program Manager: DR MARIO J CAZECA
Contract #:
Title: LANGMUIR-BLODGETT MONOLAYER FILMS OF PHOTOPROTEIN SYSTEMS FOR DYNAMIC PHOTO RESPONSE TO THE SURROUNDING MEDIUM
Topic #: A90-274 Office: NATICK ID #: 42015

RECENTLY, WELL ORDERED TWO-DIMENSIONAL STRUCTURES OF PHOTODYNAMIC PROTEINS SUCH AS PHYCOBILIPROTEINS AND BACTERIORHODOPSIN (bR) HAVE BEEN PREPARED, USING THE LANGMUIR-BLODGETT TECHNIQUE. WHILE bR PARTICIPATES IN PHOTON DRIVEN PROTON PUMPING, PHYCOBILIPROTEINS FORM PART OF THE PHOTON HARVESTING ASSEMBLIES IN CERTAIN ALGAE. THE PHOTODYNAMIC RESPONSE OF THE CROMOPHORE IN bR IS REASONABLY WELL UNDERSTOOD. THE RESPONSE OF THE TETRAPYRROLE CHROMOPHORE IN THE PHYCOBILIPROTEINS NEEDS TO BE CLEARLY ESTABLISHED. AS PHOTOINDUCED (IN THE VISIBLE SPECTRUM) STRUCTURAL AND ELECTRONIC CHANGES OCCUR IN THIS CHROMOPHORE, THE CHARACTERISTIC ELECTRONIC RESPONSE MAY BE UTILIZED TO DESIGN A PHOTORESPONSE CORRESPONDING TO THE INCIDENT SPECTRUM. IT IS PROPOSED THAT TWO-DIMENSIONAL LATTICES OF AT LEAST ONE OF THESE PHOTODYNAMIC PROTEINS BE PREPARED FOR THE FIRST TIME IN CONJUNCTION WITH AN ELECTRICALLY CONDUCTING MOLECULAR MEDIUM. IT IS DESIRED THAT THE ELECTRONIC SIGNATURE OF THE DYNAMIC PHOTORESPONSE OF THE PROTEIN BE RECORDED VIA THE CONDUCTING SEGMENT. THIS CHARACTERISTIC ELECTRONIC SIGNATURE CAN BE SUBSEQUENTLY UTILIZED TO DRIVE MOLECULAR OPTICAL ELEMENTS MIMICKING THE INCIDENT SPECTRUM 180 DEG SHIFTED IN PHASE.

ORCON CORP
1570 ATLANTIC ST
UNION CITY, CA 94587
Program Manager: DR FRANK DOLJACK
Contract #:
Title: LIGHTWEIGHT FLEXIBLE COMPOSITE TENT MATERIALS
Topic #: A90-275 Office: NATICK ID #: 42016

FABRICS FOR ARMY TENTS ARE CURRENTLY BEING MADE OF COATED FABRICS. THE REQUIREMENTS OF THESE MATERIALS ARE LIGHTWEIGHT, HIGH STRENGTH, FIRE RESISTANT, WATER RESISTANT, AND WEATHER RESISTANT. A COMPOSITE MATERIAL OF FILM OR NONWOVEN LENDS ITSELF TO THIS APPLICATION AT A LOWER WEIGHT AND HIGHER STRENGTH THAN COATED FABRICS. A STUDY WILL BE PERFORMED OF THE CURRENT MATERIALS AND TECHNOLOGIES AVAILABLE FOR ARMY TENT FABRICS. AN ANALYSIS OF MATERIALS APPROPRIATE FOR A LIGHTWEIGHT COMPOSITE WILL BE CHOSEN FOR

PROTOTYPE SAMPLES. THE DATA FROM THE LITERATURE AND PRODUCT TESTING WILL BE EVALUATED AND SEVERAL MATERIALS WILL BE RECOMMENDED BASED ON WEIGHT, COST, AND PHYSICAL PROPERTIES.

PIONEER TECHNOLOGY INC
24079 RESEARCH DR
FARMINGTON HILLS, MI 48024
Program Manager: THACH NGO
Contract #:
Title: 2D RASTER TO 3D VECTOR MODELING UTILITIES
Topic #: A90-276 Office: TACOM ID #: 42055

THE PURPOSE OF THIS PROPOSAL IS TO DEMONSTRATE THE FEASIBILITY IN DEVELOPING A BI-DIRECTIONAL (2 WAY) CADD TRANSLATOR BETWEEN DSREDS SYSTEMS (2D RASTER) AND THE INTERGRAPH CADEM SYSTEM. THE DEVELOPMENT OF SUCH A TRANSLATOR WILL GREATLY REDUCE THE MANPOWER WASTE AND DUPLICATION OF EFFORT THAT ARE INHERIT IN THE CURRENT METHODOLOGY USED. DUE TO PIONEER TECHNOLOGY EXTENSIVE EXPERIENCE WITH THE INTERGRAPH CADD (COMPUTER AIDED DESIGN AND DRAFTING) SYSTEM AND DIRECT TRANSLATORS, OUR ULTIMATE GOAL WOULD BE THE DEVELOPMENT OF A NO HASSLE TRANSLATOR FOR DAILY USE. TO ACCOMPLISH THIS GOAL OF TRANSLATION OF 2D RASTER TO 3D VECTOR WE WOULD REQUIRE ACCESS TO THE LATEST FILE SPECIFICATION OF BOTH THE DSREDS AND INTEGRAPH SYSTEMS. TO HANDLE THE MULTITUDE OF POTENTIAL CONFLICTS WITHIN THE TRANSLATOR WE WOULD USE THE TECHNIQUE OF FUZZY LOGIC THAT HAS MADE THE JAPANESE CONSUMER PRODUCTS SO VERSATILE IN OPERATION. THE APPLICATION OF FUZZY LOGIC WITHIN A TRANSLATOR HAS MANY UNIQUE ADVANTAGES. FUZZY LOGIC, THE ABILITY FOR A COMPUTER, OR SOFTWARE, TO DISTINGUISH BETWEEN GRAY AREAS OF DECISIONS ALLOWS FOR APPLICATION OF ARTIFICAL INTELLIGENCE TO BE APPLIED TO REAL WORLD PROBLEMS. A CLASSIC EXAMPLE OF THIS IS THE CURRENT RELEASE IN JAPAN OF PERSONAL COMPUTERS (PCs) THAT CAN READ HANDWRITING IN EITHER ENGLISH, OR JAPANESE KANJI CHARACTERS. AT THIS EXAMPLE ILLUSTRATES, RASTER FILES TRANSLATION HAS THE SAME PROBLEMS IN DETERMINING ELEMENT TYPES AS WOULD A COMPUTER TRYING TO READ SOMEONE' HANDWRITING. WITH THE APPLICATION OF FUZZY LOGIC WE WILL BE ABLE TO MAKE A MUCH MORE INTELLIGENT AND HASSLE FREE TRANSLATOR.

MAINSTREAM ENGINEERING CORP
200 YELLOW PL - PINES INDUSTRIAL CTR
ROCKLEDGE, FL 32955
Program Manager: DR ROBERT P SCARINGE
Contract #:
Title: DEMONSTRATION OF AN INNOVATIVE TACOM PERSONNEL HEATER
Topic #: A90-277 Office: TACOM ID #: 42056

PRESENTLY THE ARMY HAS TWO SIZES OF PERSONNEL HEATERS IN TRACKED VEHICLES. THE SMALLER ONE PRODUCES UP TO 50,000 BTU/HR AND THE LARGER ONE 60,000 BTU/HR. THESE UNITS WERE DESIGNED OVER FORTY YEARS AGO USING TECHNOLOGY AVAILABLE AT THE TIME. SUBSEQUENT RESEARCH IN COMBUSTION, POWER CONVERSION, HEAT TRANSFER, AND FLUID FLOW ALLOW THE POSSIBILITY FOR TREMENDOUS IMPROVEMENTS IN THESE DESIGNS. A RECENT STUDY FOR TACOM HAS IDENTIFIED SEVERAL POTENTIAL ALTERNATIVES FOR BURNER DESIGN, AND POWER GENERATION, HOWEVER THIS STUDY ATTEMPTED TO PROVIDE SOLUTIONS BY EMPLOYING EXISTING HARDWARE. THE MAINSTREAM EFFORT PROPOSED HERE INTENDS TO CARRY THIS RESEARCH A STEP FURTHER, BY INVESTIGATING AN ALTERNATIVE METHOD OF FUEL COMBUSTION, AND PARASITIC ELECTRIC PRODUCTION, AND THEREBY IMPROVE RELIABILITY AND REDUCE UNIT COST. THE PROBLEM WITH CURRENT SELF- SUFFICIENT HEATING SYSTEMS IS THE REQUIRED NUMBER OF THERMOELECTRIC DEVICES NEEDED FOR THE GENERATION OF ANY REASONABLE VOLTAGE, AS WELL AS THE COMPLEX ELECTRONIC POWER CONDITIONING AND CONTROL

NECESSARY TO REGULATE THE POWER PRODUCED AND TO PERFORM THE SWITCH-OVER TO INTERNAL SELF-GENERATED POWER. THE MAINSTREAM DESIGN USES AN INNOVATIVE AND MORE RELIABLE APPROACH TO BOTH THE COMBUSTION AND THE ELECTRICAL PRODUCTION.

ATLANTIC AEROSPACE ELECTRONICS CORP
6404 IVY LN - STE 300
GREENBELT, MD 20770
Program Manager: DAVID T AUCKLAND
Contract #:
Title: FOUR INPUT STACKED MICROWAVE ANTENNA
Topic #: A90-278 Office: TACOM ID #: 42058

THE PRIMARY OBJECTIVE OF THIS PROPOSAL IS TO OBTAIN A SPECIFIC HARDWARE DESIGN THAT ALLEVIATES THE CURRENT DEFICIENCY IN THE PRESENT LINE-OF-SIGHT MICROWAVE VIDEO DATA LINK USED FOR ROBOTIC VEHICLE CONTROL. TWO HARDWARE CONFIGURATIONS WILL BE CONSIDERED. THE FIRST CONFIGURATION IS AN EFFICIENT FOUR-INPUT STACKED ANTENNA THAT IS EXPECTED TO YIELD LESS THAN 0.5 dB OF LOSS PER CHANNEL. THE SECOND CONFIGURATION IS A LOW LOSS MULTIPLEXER THAT, DEPENDING ON SPECIFIC PERFORMANCE REQUIREMENTS, MAY BE COMMERCIALLY AVAILABLE WITH LESS THAN 1 dB OF LOSS PER CHANNEL. ENGINEERING SKETCHES FOR THE ANTENNA DEIGN AND OUTLINE DRAWINGS FOR THE MULTIPLEXER WILL BE PROVIDED FOR COMPLETE HARDWARE PROTOTYPE FABRICATION AND TEST IN PHASE II. BREADBOARD PROTOTYPES FOR SOME OF THE KEY COMPONENTS OF THE ANTENNA WILL BE FABRICATED AND BENCH TESTED IN PHASE I. TEST RESULTS AND PROCEDURES WILL BE DOCUMENTED. A SECOND OBJECTIVE OF THIS PROPOSAL IS TO RECOMMEND A HARDWARE DEVELOPMENT PLAN FOR ACCOMPLISHING THE VIDEO TRANSMISSION FUNCTION WITH A NON-LINE-OF-SIGHT SYSTEM. THIS APPROACH WILL BE BASED ON DIGITAL COMMUNICATION TECHNOLOGY AND WILL USE DATA COMPRESSION. DETAILS WILL BE INCLUDED IN THE PHASE II PROPOSAL.

FLAM & RUSSELL INC
PO BOX 999 - 506 PRUDENTIAL RD
HORSHAM, PA 19044
Program Manager: RICHARD MATYSKIELA
Contract #:
Title: FOUR INPUT STACKED MICROWAVE ANTENNA
Topic #: A90-278 Office: TACOM ID #: 42057

A UNIQUE AND BENEFICIAL CONFIGURATION FOR A MULTIPLE INPUT OMNI- DIRECTIONAL MICROWAVE ANTENNA IS DESCRIBED, IN WHICH A CIRCULAT PHASED ARRAY OF EIGHT ANTENNA ELEMENTS IS FED BY AN EIGHT INPUT BUTLER NETWORK. PROPER DESIGN OF THE ARRAY GEOMETRY AND NETWORK WILL ALLOW UP TO SEVEN TRANSMITTERS TO SHARE THE SAME ANTENNA SIMULTANEOUSLY WITHOUT INTERFERENCE, EACH TRANSMITTER PRODUCING AN OMNI-DIRECTIONAL RADIATION PATTERN. THE TRANSMITTERS ARE ISOLATED FROM ONE ANOTHER BY THE BUTLER NETWORK. A PHASE I STUDY IS PROPOSED TO INVESTIGATE THE CRITICAL DESIGN ASPECTS OF THE CONFIGURATION THROUGH ANALYSIS, COMPUTER MODELING AND LABORATORY EXPERIMENT. PHASE I WOULD RESULT IN THE COMPLETE CONCEPTUAL DESIGN OF THE MULTIPLE INPUT ANTENNA. CRITICAL ASPECTS OF THE DESIGN WILL BE VERIFIED THROUGH TESTING IN THE LABORATORY, THEREBY PROVIDING THE FEASIBILITY OF THE CONCEPT AND ELIMINATING THE RISK FOR FURTHER DEVELOPMENT IN PHASE II.

TINDEV INC
5 LAUREL DR

LINCOLN, MA 01773
Program Manager: FREDERICK M TINGLEY
Contract #:
Title: INVESTIGATION OF THE COOLING OF AXLE SUMPS USING HEAT PIPES
Topic #: A90-279 Office: TACOM ID #: 42059

THE ABILITY OF HEAT PIPE TECHNOLOGY TO CONDUCT ENERGY FROM OVER HEATED AXLE SUMPS ON MILITARY VEHICLES WILL BE DETERMINED. THE EXISTING SITUATION AND THE DESIRED CHARACTERISTICS WILL BE DEFINED AND THE PRESENT THERMAL FLOW MODELED ANALYTICALLY AND EXPERIMENTALLY. DIFFERENT COLLECTOR/HEAT PIPE/DISSIPATOR CONFIGURATIONS WILL BE ENTERED INTO BOTH MODELS UNTIL THE OPTIMUM SOLUTION IS FOUND. A PROTOTYPE DESIGN WILL BE MADE.

PHYSICAL OPTICS CORP
20600 GRAMERCY PL - STE 103
TORRANCE, CA 90501
Program Manager: DR WILLIAM LIU
Contract #:
Title: A HIGHLY FUNCTIONAL AND VERSATILE CAMERA PLATFORM FOR A MULTI-PURPOSE ROBOTIC VEHICLE
Topic #: A90-280 Office: TACOM ID #: 42060

POC PROPOSES TO DESIGN AND DEVELOP A HIGHLY FUNCTIONAL AND VERSATILE CAMERA PLATFORM FOR A MULTI-PURPOSE ROBOTIC VEHICLE UTILIZING A NOVEL MODULAR APPROACH. THE PLATFORM REQUIRES ONLY ONE CCD CAMERA, FOUR COMPUTER-CONTROLLED ROTATION STAGES AND 3 MODULAR OPTICAL IMAGING SYSTEMS TO PROVIDE BOTH A STEREO VISION MODE AT ANY DESIRED VIEWING ANGLE AND A PERIPHERAL VISION MODE WITH A 180 DEG NON- OVERLAPPING FIELD-OF-VIEW. THE PERIPHERAL VIEW FROM THE LENS SYSTEM OF EACH MODULE IS COLLECTED BY 1 OF 3 FLEXIBLE COHERENT FIBEROPTIC BUNDLES AND TRANSMITTED COLLECTIVELY TOWARDS A SINGLE CCD CAMERA. STEREO VISION MODE IS ACCESSED BY ALIGNING ANY TWO OF THE THREE MODULES IN PARALLEL USING THEIR RESPECTIVE ROTATION STAGES. WHEN THE ENTIRE ASSEMBLY IS ROTATED BY ANOTHER ROTATION STAGE, ANY VIEWING ANGLE DESIRED IS OBTAINED. THE VERSATILITY OF THE PROPOSED PLATFORM OFFERS SIGNIFICANT ADVANTAGES OVER A 3-CAMERA SYSTEM IN TERMS OF ADAPTABILITY (DEPENDING ON NEED, 3 CAMERAS CAN ALSO BE USED), SMALLER FOOTPRINT, EASY AND HIGHLY ACCURATE ALIGNMENT, FAST RESPONSE TIME IN CONVERTING FROM ONE MODE TO THE OTHER THROUGH ELECTROMECHANICAL MEANS, HIGH SURVIVABILITY OF THE PLATFORM AND HIGH IMMUNITY TO VIOLENT MOVEMENT OF THE VEHICLE.

SECOND DIFFERENCE INC
5272 CHURCH HILL DR
TROY, MI 48098
Program Manager: DR MARVIN E WALDEN
Contract #:
Title: INTELLIGENT FEATURE MODELLING LIBRARIES
Topic #: A90-281 Office: TACOM ID #: 42061

WE PROPOSE TO USE APPLICATION PROTOTYPING METHODS IN PERFORMANCE OF A SYSTEM DESIGN STUDY TO DEVELOP STANDARDIZED MODEL LIBRARIES OF COMMONLY USED COMPONENTS AND DRAWING SYMBOLS TO BE USED ON THE CADEM GROUP'S INTERGRAPH-CRAY NETWORK. WE REFER SPECIFICALLY TO THE INTERGRAPH ENGINEERING MODELLING SYSTEM (EMS) ON THE MODEL 40 INTERACT WORKSTATION, BUT PORTABILITY TO OTHER HARDWARE WILL BE ASURED AS PART OF OUR SYSTEM DESIGN DISCIPLINE. STANDARD MODELLING PRACTICES ARE NEEDED FOR CREATION OF COMMONLY USED PARTS SUCH AS NUTS, BOLTS, BOSSES, ETC. CURRENTLY, PARTS ARE CONSTRUCTED ANEW AS NEEDED,

EVEN IF THEY DIFFER ONLY IN ORIENTATION OR LOCATION FROM PREVIOUSLY DESIGNED PARTS. THIS RESULTS IN A LARGE DUPLICATION OF DESIGN EFFORT. INTELLIGENCE WILL BE APPLIED AT THREE STAGES OF LIBRARY USE: LOADING THE LIBRARY WITH NEW FEATURES, RETRIEVAL OF FEATURES, AND INCORPORATION OF FEATURES INTO A LARGER DESIGN. ALGORITHMS FROM THE MATHEMATICS OF CAD AND AUTOMATED REASONING WILL BE USED.

S-TRON
101 TWIN DOLPHIN DR
REDWOOD CITY, CA 94065
Program Manager: OLIVER J EDWARDS
Contract #:
Title: COMBAT UNITY VISION DEVICE WITH MODULAR LASER FILTER
Topic #: A90-282 Office: TACOM ID #: 42062

ON THE NEAR-TERM BATTLEFIELD, FREQUENT LASER IRRADIATION OF PERSONNEL AND SENSORS IS VERY LIKELY. THIS RADIATION-RICH ENVIRONMENT WILL POSE A SERIOUS OCULAR HAZARD TO UNPROTECTED PERSONNEL PEERING FROM THE RELATIVE DARKNESS OF VEHICLE INTERIORS. THERE ARE MANY VISIBLE COMMERCIAL LASERS MAY BECOME SUPPRESSIVE THREATS BY MERE TRANSPORTATION TO THE BATTLEFIELD. PROTECTION BY REJECTION FILTERS SIMULTANEOUSLY AT MANY WAVELENGTHS WILL CRIPPLE THE SOLDIER'S VISION. THERE IS NO PRACTICABLE OPTICAL LIMITING TECHNIQUE WHICH OFFERS ANY PROMISE OF THE REQUISITE SHUTTERING TO 4D IN ONE PICOSECOND WITH A USEFUL DYNAMIC RANGE OF A MILLION TO ONE. S-TRON PROPOSES OPTIMIZATION OF FIXED-WAVELENGTH FILTERS BY INTERFERENCE AND DYE TECHNIQUES FOR COUNTERING ACTUAL THREAT LASERS AS THEY APPEAR, ON A CASE BY CASE BASIS; AND THE DESIGN OF A COMMANDER'S SHORT PERISCOPE TO ACCOMMODATE THESE SPECIALIZED FILTERS INTERCHANGEABLY. THE PRACTICALITY OF INDIRECT VISION WITHIN THE PERISCOPY BODY, WITH THE SENSOR ITSELF INCOMPLETELY PROTECTED BY MODULAR FILTERS, WILL ALSO BE ANALYZED.

SYNERNET CORP
39420 LIBERTY ST - STE 140
FREMONT, CA 94538
Program Manager: JOHN E TOPE
Contract #:
Title: ADVANCED DRIVERS STATION
Topic #: A90-283 Office: TACOM ID #: 42063

THE ADVANCED DRIVERS STATION PROJECT PROVIDES ADDITIONAL CAPABILITY TO THE VETRONICS CREW DISPLAY DEMONSTRATOR (VCDD). THE VCDD IS THE FIRST OF SEVERAL DEMONSTRATORS THAT WILL BE INSTALLED IN THE VETRONICS LABORATORY. THE VCDD CURRENTLY HAS TWO STATIONS REPRE- SENTING A COMMANDER AND GUNNER STATION. PHASE I OF PROJECT WILL PROVIDE THE HARDWARE AND SOFTWARE NECESSARY TO ADD AN ADVANCED DRIVERS STATION TO THE VCDD. THE ADVANCED DRIVERS STATION WILL REPRESENT A TANK TYPE DRIVERS STATIONS. IT WILL HAVE THREE VIDEO MONITORS WITH TOUCH PANELS AND A T-BAR FOR DRIVER CONTROL. THE REQUIREMENTS FOR A GENERIC SOLDIER-MACHINE INTERFACE WILL BE DEVELOPED IN PHASE II OF THE PROJECT AND WILL BE BASED UPON THE RESULTS OF THE PHASE I EFFORT. THE PROPOSED PROJECT COMBINES SYNERNET'S EXPERIENCE IN SUPPORT OF AIRCRAFT CONTROL RESEARCH WITH FMC'S EXPERIENCE IN COMBAT VEHICLES AND THE STANDARD ARMY VETRONICS SYSTEM ARCHITECTURE PROGRAM.

SYNERNET CORP
39429 LIBERTY ST - STE 140
FREMONT, CA 94538
Program Manager: JOHN E TOPE

Contract #:
Title: ADVANCED DISPLAYS AND CONTROLS
Topic #: A90-284 Office: TACOM ID #: 42064

THE ADVANCED DISPLAYS AND CONTROLS PROJECT WILL PROVIDE A GENERIC INTERFACE TO A VARIETY OF CONTROLS AND DISPLAYS THAT COULD BE INCORPORATED INTO THE VETRONICS CREW DISPLAY DEMONSTRATOR (VCDD). THE PROJECT WILL PROVIDE THE CAPABILITY TO EVALUTE A NUMBER OF TECHNOLOGIES AND TO DEVELOP SPECIFICATIONS FOR THE MAN-MACHINE INTERFACE FOR FUTURE COMBAT AND TACTIAL VEHICLES. TO DEMONSTRATE THE FEASIBILITY OF ADDING ADVANCED CONTROLS, THE FMC DEVELOPED COMBAT VEHICLE GRIPSTICK WILL BE INTERFACED TO THE VCDD. THIS DEVICE IS AN ADVANCED CONTROL DEVICE AND WILL BE MADE AVAILABLE TO THE GOVERNMENT ON BAILMENT. AN APPROACH TO THE PHASE II EFFORT WILL BE DEVELOPED TO PROVIDE A GENERIC INTERFACE FOR A NUMBER OF DIFFERENT CONTROL AND DISPLAY DEVICES AND TECHNOLOGIES.

DIAGNOSTIC EQUIPMENT DEVELOPMENT INC
PO BOX 2056
ASTON, PA 19014
Program Manager: DAVID B BOARD
Contract #:
Title: COMBAT VEHICLE FINAL DRIVE MONITORING FOR MAINTENANCE ON DEMAND
Topic #: A90-286 Office: TACOM ID #: 42065

DIAGNOSTIC TECHNIQUES FOR MONITORING OF DYNAMIC COMPONENTS SUCH AS GEARS, BEARINGS, AND SHAFTS WILL BE EVALUATED AND INTEGRATED INTO AN OVERALL CONCEPT FOR A COMBAT VEHICLE FINAL DRIVE MONITORING SYSTEM. A DRAFT SPECIFICATION WILL BE WRITTEN TO DEFINE THE FUNCTIONAL ELEMENTS OF A FINAL DRIVE MONITORING SYSTEM FOR THE DRIVE TRAIN OF A SELECTED VEHICLE. THE SYSTEM SPECIFICATION WILL INCLUDE ALGORITHMS FOR DATA PROCESSING, DATA COMPRESSION, DATA SAMPLING ROUTINES, AND VOTING LOGIC TO MAXIMIZE THE PROBABILITY OF DETECTING TRUE FAULTS WHILE MINIMIZING THE PROBABILITY OF TRIGGERING A FALSE ALARM.

POWDERED MATERIALS APPLICATIONS INC
PO BOX 40188
BAY VILLAGE, OH 44140
Program Manager: WALTER J MACIAG
Contract #:
Title: INVESTIGATION OF BEARING TECHNOLOGY
Topic #: A90-287 Office: TACOM ID #: 42066

THE OBJECTIVES OF THIS PROGRAM ARE TO: (a) DEMONSTRATE THE FEASIBILITY OF "GC" DESIGN CONFIGURED BEARINGS, MANUFACTURED WITH SELECTED POWDERED MATERIALS TO ELIMINATE FIELD MAINTENANCE AND SERVICE REQUIREMENTS OF HMMVV UNIVERSAL JOINTS AND FIVE TON TRUCK SLEEVE BEARINGS AND TO (b) DEMONSTRATE THIS SUPERIOR PERFORMANCE BY DIRECT COMPARISON OF PROTOTYPE "GC" UNIVERSAL JOINTS AND SLEEVE BEARINGS IN SIDE BY SIDE LABORATORY BENCH TESTS WITH PRESENT HMMVV AND FIVE TON TRUCK VEHICLE COMPONENTS. THE PATENTED DESIGN CONCEPT NAMED "GEOMETRIC CONTOURING" (GC), FOR THEIR DESIGN CONFIGURATIONS ELMINATES ROLLERS IN THE UNIVERSAL JOINT AND EXTENDS LIFE AND PERFORMANCE OF BOTH THE U JOINT AND SLEEVE BEARINGS. R&D POWDERED MATERIALS APPLICATIONS, INC. (PMA) HAS LED TO INNOVATIVE WEAR REDUCING DESIGNS AND MATERIALS THAT PROVIDE MAINTENANCE FREE BEARING OPERATION AND INCREASES IN THEIR DURABILITY AND LIFE WITH SIGNIFICANT COST REDUCTIONS AND ENHANCED VEHICLE READINESS & AVAILABILITY. THE GC CONFIGURATIONS CAN BE APPLIED TO ROLLER BALL AND SLEEVE BEARINGS, BUSHINGS AND THRUST WASHERS. THEIR SIGNIFICANTLY LOWER COSTS AND ELIMINATED MAINTENANCE PROMISE A MAJOR BENEFICIAL IMPACT FOR ALL MILITARY VEHICLES,

EQUIPMENT AND APPLIANCES.

QUEST INTEGRATED INC
21414 - 68TH AVE S
KENT, WA 98032
Program Manager: DR PETER H -T LIU
Contract #:
Title: DEVELOPMENT OF A FIBER-OPTIC CHAMBER PRESSURE TRANSDUCER
Topic #: A90-288 Office: TECOM ID #: 42067

A FIBER-OPTIC PRESSURE TRANSDUCER (FOPT) BASED ON PATENTED FIBER-OPTIC SENSING METHODS WILL BE DEVELOPED FOR USE IN PRESSURE CHAMBERS AT PRESSURES FROM 50,000 TO 120,000 POUNDS PER SQUARE INCH. THE FOPT, OPERATING IN EITHER THE AMPLITUDE- OR PHASE-MODULATION MODE, WILL DETECT THE DISPLACEMENT OF A DIAPHRAGM AS A MEASURE OF THE EXTERNAL PRESSURE. THE FOPT WOULD HAVE VERY HIGH RESONANT FREQUENCY TO ACHIEVE A FREQUENCY RESPONSE OF BETTER THAN 150 kHz. UNLIKE THE PIEZOELECTRIC TRANSDUCER, THE FOPT WILL MEASURE THE STATIC RATHER THAN THE DYNAMIC PRESSURE. OPTICAL SENSING VIA A FIBER-OPTIC LINK WILL ISOLATE THE ELECTRONICS FROM THE HOSTILE ENVIRONMENT AND ALLEVIATE ELECTRONIC DRIFT DUE TO INTERFERENCE FROM STRONG ELECTROMAGNETIC AND RADIO FREQUENCY FIELDS AND/OR TEMPERATURE VARIATIONS. THE PROPOSED DEVELOPMENT EFFORT WILL BE AN EXTENSION OF AN ONGOING ARMY-SPONSORED SBIR PHASE II PROGRAM TO DEVELOP AN FOPT FOR PRESSURE MEASUREMENTS UP TO 100,000 psi IN GUN-BARREL ENVIRONMENTS. FOR THAT APPLICATION, SPECIAL SENSOR CONFIGURATIONS WERE DESIGNED EMPLOYING A FINITE ELEMENT ALGORITHM IN ORDER TO AVOID CONCENTRATION OF LOCAL STRESS POTENTIALLY EXCEEDING THE YIELD STRENGTH OF AVAILABLE ALLOYS. THE PROPOSED EXTENSION 120,000 psi IS BY NO MEANS TRIVIAL. THE KEYS TO THE SUCCESS OF THE PROPOSED DEVELOPMENT WILL BE INNOVATIVE DESIGN OF THE SENSOR CONFIGURATION USING A HIGH-STRENGTH/LOW-MODULUS MATERIALS AS WELL AS STABILIZATION OF THE LIGHT SOURCE.

INTER-SCIENCE INC
105 JORDAN RD
TROY, NY 12180
Program Manager: MICHAEL AMPELA
Contract #:
Title: HIGH RESOLUTION OPTICAL SKYSCREEN SYSTEM FOR IMPROVED PROJECTILE SENSING
Topic #: A90-290 Office: TECOM ID #: 42068

THE ABILITY TO ACCURATELY AND INSTANTANEOUSLY DETECT SUPERSONIC PROJECTILES IS TANTAMOUNT TO AN EFFICIENT WEAPONS TESTING AND/OR TRAINING PROGRAM. CURRENTLY, THERE IS NO COMMERCIALLY AVAILABLE DETECTION SYSTEM WHICH SATISFIES THE ARMY'S REQUIREMENTS FOR BALLISTICS. A PROGRAM TO DEVELOP A HIGH RESOLUTION OPTICAL SKYSCREEN (HIROS) IS PROPOSED. THE HIROSS SYSTEM INCORPORATES LOCAL INTELLIGENCE TO PROCESS INFORMATION FROM AN ARRAY OF PHOTODETECTORS TO ATTAIN HIGH SPEED, HIGH RESOLUTION PERFORMANCE WITH IMPROVED DISCRIMINATION CHARACTERISTICS AND THE ABILITY TO DETERMINE THE PROJECTILE TRAJECTORY. THE SYSTEM CONSISTS OF A HIGH SPEED PHOTO- DIODE ARRAY, A DECISION MAKING LOGIC INTERFACE MODULE, AND A STREAM- LINED DATA ACQUISITION SYSTEM. THE COMBINED SYSTEM WILL ACCURATELY AND AUTOMATICALLY EVALUATE THE PERFORMANCE OF DYNAMIC PROJECTILES WHILE PROVIDING SECURE DOWNRANGE FEEDBACK. RECENT DEVELOPMENTS IN OPTICAL COMPONENTS AND IMAGING TECHNOLOGIES HAVE MADE IT POSSIBLE TO DEVELOP EFFECTIVE SYSTEMS TO REPLACE PRESENT DAY SYSTEMS. HIROSS WILL REVOLUTIONIZE PROJECTILE SENSING EQUIPMENT FOR USE IN ARMY APPLICATIONS BY PROVIDING ACCURATE, HIGH SPEED ELECTRONIC FEEDBACK WITH MINIMAL USER INTERVENTION.

PRODUCT PLANNING INC
2125 OXFORD RD
DES PLAINES, IL 60018
Program Manager: BERNARD BISHOP
Contract #:
Title: HIGH SPEED AERIAL CABLE TARGET TROLLEY
Topic #: A90-291 Office: TECOM ID #: 42069

THE OBJECTIVE OF THIS BASIC RESEARCH IS TO DETERMINE THE FEASIBILITY OF DESIGNING A HIGH SPEED TARGET TROLLEY FOR USE ON AN AERIAL CABLE. A 550 KNOT TARGET TROLLEY MAY BE POSSIBLE BECAUSE OF TWO RECENT TECHNOLOGICAL DEVELOPMENTS. THE FIRST OF THESE IS THE DEVELOPMENT OF HIGH STRENGTH, LOW WEIGHT ARAMID FIBER CABLE. THE SECOND IS THE RECENT CONCEPTION OF A NEW CAPSTAN PRINCIPLE BASED ON BI-HELICAL CAMMING. TO INVESTIGATE THE POTENTIAL OF THIS RELATIONSHIP EMPIRICAL CALCULATIONS, FINITE ELEMENT ANALYSIS AND CRITICAL ITEM TESTING WILL BE USED TO EVALUATE AN OPTIMIZED TROLLEY DRIVE. THE UNIQUE APPLICATION AND DISTRIBUTION OF FORCE BY THE CAPSTAN DRIVE TO THE AERIAL CABLE WOULD PERMIT CONTROLLED ACCELERATION AND DECELERATION OF THE TROLLEY. THE SIZE AND WEIGHT OF THE PROPOSED TROLLEY WOULD BE MINIMAL AS COMPARED TO THE PAYLOAD. IT IS BELIEVED THAT INTERNAL AND EXTERNAL CABLE ABRASION WILL BE VIRTUALLY ELIMINATED SINCE THIS NEW CAPSTAN DRIVE HAS NO CABLE SLIDING AND OPERATES WITH AN ELLIPTICAL BEND RADIUS MULTIPLIER.

TVI CORP
10700 HANNA ST
BELTSVILLE, MD 20705
Program Manager: FRANK GRAHAM
Contract #:
Title: CONCEPTUALIZATION DESIGN AND PROTOTYPING OF HIGH-VELOCITY SIMULATED AIRPLANE TARGETS OPERATING ON AN AERIAL CABLE TROLLEY
Topic #: A90-292 Office: TECOM ID #: 42070

AN INVESTIGATION WILL BE CONDUCTED TO DETERMINE THE DESIGN PARAMETERS NECESSARY TO DEVELOP AN AIRBORNE TARGET SYSTEM THAT CAN BE ATTACHED TO AN AERIAL-CABLE-SUPPORTED AND GUIDED TROLLEY. THE TROLLEY PROPELLED SYSTEM WILL BE CAPABLE OF SPEEDS UP TO AND INCLUDING 550 KNOTS (APPROX. 630 mph). DUE TO THE MAXIMUM TROLLEY SPEED OF 550 KNOTS AND THE CATENARY CURVE OF THE SUPPORT CABLE, IT WILL BE NECESSARY FOR THE TARGET ASSEMBLY TO MAINTAIN A NEUTRAL LIFT CONFIGURATION THROUGH THE ENTIRE OPERATIONAL RUN CONSISTING OF RAPID ACCELERATION, CONSTANT SPEED AND RAPID DECELERATION. NEUTRAL LIFT AND TARGET STABILITY MUST BE MAINTAINED DURING THE ENTIRE OPERATIONAL CYCLE. IT WILL ALSO BE NECESSARY TO COORDINATE THE DESIGN EFFORT WITH THE EFFORT BEING EXTENDED ON THE "HIGH SPEED AERIAL CABLE TARGET TROLLEY" (REF: SBIR #A90-291). THIS JOINT EFFORT IS NECESSARY TO ESTABLISH (1) WEIGHT LIMITTIONS, (2) STRUCTURAL LOADING (G'S) RESULTING FROM ACCELERATION, STEADY SPEED AND DECELERATION, (3) QUICK CONNECT AND DISCONNECT FROM TROLLEY, (4) AUTOMATIC DISCONNECT AND DESCENT, IF REQUIRED, DURING FLIGHT AND (5) QUICK DISCONNECT POWER CABLES BETWEEN TROLLEY AND TARGET.

PHYSICAL SCIENCES INC
20 NEW ENGLAND BUSINESS CTR
ANDOVER, MA 01810
Program Manager: R DANIEL FERGUSON
Contract #:
Title: COMPACT FAST RESPONSE TRANSDUCER FOR DIRECT HEAT FLUX MEASUREMENT
Topic #: A90-294 Office: TECOM ID #: 42071

A DEVELOPMENT PROGRAM FOR A NOVEL APPROACH TO HEAT FLUX MEASUREMENT IS PROPOSED. MULTI-ELEMENT PYROELECTRIC FILM TRANSDUCERS CAN PROVIDE SIMULTANEOUS DIRECT MEASUREMENT OF FAST TEMPERATURE TRANSIENTS, AND ACCURATE INSTANTANEOUS HEAT FLUX (Btu/ft(2)-s) (BOTH THE CONVECTIVE AND RADIANT PARTS INDEPENDENTLY) OVER LARGE, SMALL, CURVED OR FLAT AREAS. THE PHASE I EFFORT WILL YIELD A COMPACT LABORATORY PROTOTYPE HEAT FLUX TRANSDUCER WITH LESS THAN 20 ms RESPONSE TIME, SUITABLE FOR USE IN LIVE FIRE TESTING. DUE TO UNIQUE SELF-SHIELDING PROPERTIES, THE TRANSDUCER IS EXPECTED TO FUNCTION WELL IN EXTREME EMI/RFI ENVIRONMENTS. IN ADDITION, THE PHASE I RESULTS WILL SHOW THAT THE DEVICE OFFERS AN IMPORTANT CAPABILITY FOR REMOTE CALIBRATION AND SELF-TESTING. HEAT FLUX MEASUREMENTS AT KNOWN SURFACE HEATING CONDITIONS WILL BE CORRELATED WITH THEORETICAL CALCULATIONS OF TRANSDUCER RESPONSE.

CYBERNET SYSTEMS CORP
1919 GREEN RD - STE B-101
ANN ARBOR, MI 48105
Program Manager: DR BRIAN T MITCHELL
Contract #:
Title: A TECHNOLOGY CLASSIFICATION AID FOR ARTIFICAL INTELLIGENCE
Topic #: A90-295 Office: TECOM ID #: 42072

ARTIFICIAL INTELLIGENCE RESEARCH HAS PROGRESSED TO THE POINT WHERE IT HAS PRODUCED A WIDE RANGE OF APPLICATIONS, TOOLS AND TECHNIQUES. TO ASSURE THAT THESE SYSTEMS WILL RELIABLY PERFORM WILL REQUIRE THE DEVELOPMENT OF ADVANCED TESTING PROCEDURES. THIS PROPOSAL DETAILS A PLAN FOR ORGANIZING ARTIFICIAL INTELLIGENCE KNOWLEDGE AND BUILDING SOFTWARE TOOLS WHICH USE THIS KNOWLEDGE AS A FIRST STEP TOWARDS DEVELOPING THE ADVANCED TESTING PROCEDURES REQUIRED TO EVALUATE AI SYSTEMS EMBEDDED IN MILITARY COMPONENTS. THE MAJOR OBJECTIVES OF THIS PROJECT ARE (1) ORGANIZING THE CURRENT LITERATURE IN THE AI COMPUTING FIELD INTO A WORKING TAXONOMY, (2) DEVELOPING TOOLS WHICH CAN USE THIS KNOWLEDGE TO CLASSIFY AI SYSTEMS, AND (3) DEVELOPING A PROTOTYPE BENCHMARK TOOL THAT CAN PRODUCE TEST SPECIFICATIONS FOR CONSIDERED AI SYSTEMS.

ANTECH SERVICES INC
9601 OWENSMOUTH AVE - #14
CHATSWORTH, CA 91311
Program Manager: KARL BERNSTEIN
Contract #:
Title: DEPLETED URANIUM DETECTION/LOCATION SYSTEM
Topic #: A90-296 Office: TECOM ID #: 42073

DEPLETED URANIUM PENETRATOR REMNANTS MAY BE PRESENT IN THE SOIL AND ULTIMATELY COULD BECOME DISPERSED IN THE AIR OR WATER, CREATING HEALTH HAZARDS. CURRENT TRENDS AND DECONTAMINATION PRACTICES MAY REQUIRE REMOVAL AND DISPOSAL OF VAST AMOUNTS OF SOIL TO ENSURE URANIUM REMOVAL. MOST OF THIS SOIL IS NOT CONTAMINATED, AND SHOULD NOT BE STORED AT HIGH COST IN THE LIMITED SPACE AVAILABLE FOR DISPOSAL OF HAZARDOUS MATERIALS. ANTECH SERVICES, INC. HAS PROPOSED THE USE OF A MOBILE ARRAY OF SCINTILLATION DETECTORS TO DETECT DISCRETE LARGE PIECES OR AGGREGATES OF SMALL FRAGMENTS OF DEPLETED URANIUM IN SITU. THIS WILL ALLOW REMOVAL OF ONLY CONTAMINATED SOILS REDUCING THE COST AND TIME REQUIRED FOR DECONTAMINATION OF LARGE SITES. PHASE I WILL PROVIDE LABORATORY DEMONSTRATION OF A SINGLE DETECTOR SYSTEM IN MOTION, AND OPTIONALLY MAY INCLUDE FIELD DEMONSTRATION AT A DOD SITE. ANTECH AND THE PRINCIPAL INVESTIGATOR HAVE SIGNIFICANT EXPERIENCE WITH DEPLETED URANIUM DETECTION BY GAMMA RAY SPECTROSCOPY, INCLUDING DEMONSTRATION OF RAPID DETECTION AT DISTANCES GREATER THAN REQUIRED FOR THIS APPLICATION, BUT WITH LESS SHIELDING. THE DATA AGREE ACCEPTABLY WELL WITH THEORETICAL ESTIMATES OF DETECTABILITY. PHASE I WILL CONFIRM

THE THEORETICALLY PREDICTED FEASIBILITY AT SOILS DEPTHS TO TWO FEET.

PHYSICAL SCIENCES INC
20 NEW ENGLAND BUSINESS CTR
ANDOVER, MA 01810
Program Manager: WILLIAM G REINECKE
Contract #:
Title: A LASER TO MEASURE FRAGMENT VELOCITY AND MASS
Topic #: A90-297 Office: TECOM ID #: 42074

WE ARE PROPOSING TO DEVELOP A LASER DIAGNOSTIC TOOL WHICH WILL MEASURE THE INITIAL (PEAK) VELOCITIES AND VOLUMES OF WARHEAD FRAGMENTS SIMULTANEOUSLY. THIS WILL BE ACCOMPLISHED BY TAKING TIME-SEQUENCED LASER SHADOW PHOTOGRAPHS OF THE WARHEAD SIMULTANEOUSLY ALONG THREE ORTHOGONAL AXIS SHORTLY AFTER DETONATION AND CALCULATING FRAGMENT VELOCITY AND VOLUME FROM THE CORRELATED IMAGES. THIS CAN BE ACCOMPLISHED USING A LASER SOURCE BECAUSE, UNLIKE IN THE CASE OF A FLASH X-RAY, BOTH THE PHOTON SOURCE AND THE CAMERA CAN BE LOCATED REMOTELY FROM THE WARHEAD AND THE LIGHT PULSES CONDUCTED TO AND FROM THE EXPLOSION SITE BY EXPENDABLE FIBER OPTICS OR MIRRORS WHICH CAN BE DESTROYED BY THE EXPLOSION. SINCE THE FRAGMENTS REACH THEIR PEAK VELOCITIES QUICKLY, ALL THE REQUIRED DATA CAN BE ACQUIRED ON THE IMMEDIATE VICINITY OF THE WARHEAD PROVIDING THE LASER CAN PENETRATE THE SHOCKED AIR AND DETONATION PRODUCTS THAT STILL SURROUND THE FRAGMENTS. THE GOAL OF OUR PHASE I PROGRAM IS TO DEMONSTRATE EXPERIMENTALLY THAT A LASER WITH A WAVELENGTH AROUND A HALF um CAN PRODUCE WELL RESOLVED SHADOW IMAGES OF THE FRAGMENTS WITHOUT BEING UNDULY ATTENUATED BY THE HOT COMPRESSED AIR AND EXPLOSION PRODUCTS THAT SURROUND THE METAL PARTS AT THE TIME OF INTEREST. WITH SUCCESSFUL EXPERIMENTAL RESULTS, THE FEASIBILITY OF THIS INNOVATIVE TECHNIQUE WILL HAVE BEEN DEMONSTRATED.

SCIENTIFIC APPLICATIONS & RSCH ASSOCS
15206 TRANSISTOR LN
HUNTINGTON BEACH, CA 92649
Program Manager: DR PARVIZ PARHAMI
Contract #:
Title: INFORMATION PROCESSING UTILIZING A DATABASE COMPUTER
Topic #: A90-298 Office: TECOM ID #: 42075

APPROXIMATELY 80 MEGABYTES OF INFORMATION IS GATHERED DURING EACH TEST AT HELSTF, WHICH MUST BE PROCESSED AND STORED FOR FUTURE RETREIVAL. THE CURRENT STORAGE AND CPU CAPABILITIES DO NOT PERMIT KEEPING ALL OF THE DATA FROM PREVIOUS TESTS (APPROXIMATELY 70 TO DATE) READILY ACCESSIBLE. BASED ON OUR SUCCESSFUL IMPLEMENTATION OF THE DNA SPONSORED AIRBASE PROGRAM, WE HAVE PROPOSED A DEDICATED DATA BASE COMPUTER TO BE DESIGNED DURING THE PHASE I SBIR ACTIVITY FOR THE HELSTF FACILITY. ALL GIAGNOSTICS AND OBJECT INTERACTION DATA FROM EVERY TEST PROGRAM ARE TO BE STORED ON THE PROPOSED COMPUTER AND BE ON-LINE TO ALL POTENTIAL USERS. THE DATA BASE COMPUTER IS TO BE TIED DIRECTLY TO THE EXISTING HELSTF ANALYSES DEDICATED MACHINES FOR REAL TIME DATA ACCESS AND TRANSFER. THE PROPOSED DATA BASE WILL BE BASED ON SQL DATA BASE STANDARD AND WILL TAKE MAXIMUM ADVANTAGE OF PROVEN OFF-THE-SHELF SOFTWARE AND HARDWARE COMPONENTS. WE WILL USE LOSSLESS DATA COMPRESSION TO DRAMATICALLY REDUCE STORAGE REQUIREMENTS AND SPEED UP DATA TRANSFER OVER THE HELSTF LOCAL AREA NETWORK.

CREARE INC
PO BOX 71 - ETNA RD

HANOVER, NH 03755
Program Manager: DR RICHARD DRISCOLL
Contract #:
Title: ON-LINE HELIUM AND ETHYLENE MIXING SYSTEM
Topic #: A90-300 Office: TECOM ID #: 42076

THE DEVELOPMENT AND TESTING OF ADVANCED CHEMICAL LASERS WHICH USE AN ETHYLENE/HELIUM MIXTURE AS A FUEL WOULD BE CONSIDERABLY ENHANCED BY ON-LINE MIXING OF THE REACTANTS. AN INNOVATIVE MEANS TO MEET THIS NEED IS PROPOSED BASED ON TECHNOLOGY THAT HAS BEEN SUCCESSFULLY USED AT SMALLER SCALE. THE CRITICAL ASPECTS OF ETHYLENE FLOW AND STATE CONTROL WILL BE SHOWN TO BE FEASIBLE IN PHASE I. IN ADDITION, PHASE I WILL RESULT IN A DATA BASE TO PERMIT SUCCESSFUL DESIGN AND DEMONSTRATION OF A COMPLETE, RELIABLE, REAL TIME MIXING SYSTEM IN PHASE II.

CERACON INC
1101 N MARKET BLVD - STE 9
SACRAMENTO, CA 95834
Program Manager: DR RAMAS V RAMAN
Contract #:
Title: A NOVEL MANUFACTURING PROCESS ROUTE FOR FORMING HIGH-DENSITY CERAMIC ARMOR MATERIALS
Topic #: A90-302 Office: BRL ID #: 42077

SELF-PROPAGATING HIGH-TEMPERATURE COMBUSTION SYNTHESIS (SHS) IS A TECHNOLOGICALLY ATTRACTIVE PROCESS FOR FORMING SPECIAL ALLOY METALS, CERMETS, AND COMPOSITES. THE COMMERCIALLY VIABILITY OF THE PROCESS IS HAMPERED BY HIGH COSTS OF STARTING INGREDIENTS AND THE PRESENCE OF POROSITIES AND AGGLOMERATES IN THE SHS PRODUCTS. A NOVEL PROCESSING ROUTE, WHICH INVOLVES IN-SITU RAPID CONSOLIDATION DURING SHS REACTION TO FORM TiC AND TiB2 WILL BE INVESTIGATED. IT IS ANTICIPATED THAT THE USE OF THE HIGH SPEED CERAMIC CONSOLIDATION (CERACON) PROCESS DIRECTLY COUPLED WITH SHS WILL PROVIDE THE SHEAR/ HYDROSTATIC FIELD NECESSARY TO BREAK AGGLOMERATES AND ASSOCIATED INTERGRANULAR VOIDS TYPICALLY FORMING IN NORMAL SHS PRODUCTS. PROPER CONTROL OF CONSOLIDATION STRESS TENSOR WOULD THUS RESULT IN SIGNIFICANT HIGHER DENSITIES THAN THOSE ACHIEVABLE BY PURELY HYDRO- STATIC PRESSING. THE PHASE I PROGRAM WILL DEMONSTRATE FEASIBILITY OF THE SHS-CERACON CONCEPT TO FORM DENSE TiC AND TiB2 MATERIALS. PHASE I DELIVERABLES WILL INCLUDE 4" DIAMETER x 1" THICK DISCS OF TiC AND TiB2 SAMPLES AND A TECHNICAL REPORT CONTAINING PROJECTED COST ANALYSIS FOR COMMERCIAL FABRICATION OF SHS-CERACON PROCESSED MATERIALS. PHASE II WILL INVOLVE DEVELOPMENT OF A PROTOTYPE UNIT FOR THE UPSCALED HIGH-SPEED FABRICATION OF HIGH-DENSITY TiC AND TiB2 MATERIALS. PHASE III WILL DEAL WITH MANUFACTURING OF SHS PRODUCTS INCLUDING ARMOR MATERIALS FOR ARMY AND OTHER COMPOSITE MATERIALS FOR COMMERCIAL APPLICATIONS.

KMS FUSION INC
PO BOX 1567 - 700 KMS PL
ANN ARBOR, MI 48106
Program Manager: MICHAEL R WIXOM
Contract #:
Title: SELF PROPAGATING HIGH TEMPERATURE SYNTHESIS AND DYNAMIC COMPACTION OF TITANIUM CARBIDE (TiC) TITANIUM BORIDE (TiB2)
Topic #: A90-302 Office: BRL ID #: 42078

SELF PROPAGATING HIGH TEMPERATURE SYNTHESIS (SHS) OF TiC AND TiB2 RESULTS IN A HOT POROUS PRODUCT. IF THE TEMPERATURE OF THE PRODUCT EXCEEDS THE DUCTILE-BRITTLE TRANSITION

TEMPERATURE, THE HOT PRODUCT CAN BE COMPACTED TO REDUCE POROSITY AND YIELD A CONSOLIDATED BODY WITH USEFUL STRUCTURAL PROPERTIES. SEVERAL COMPACTION TECHNIQUES HAVE BEEN CONSIDERED. AMONG THESE, EXPLOSIVELY GENERATED DYNAMIC COMPACTION (DC) HAS PROVIDED PROMISING RESULTS IN LABORATORY DEMONSTRATIONS. IN THIS PROJECT WE PROPOSE TO SCALE UP THE LABORATORY DEMONSTRATION INTO A PRODUCTION PROCESS FOR TiC AND TiB2. THE SCALED UP PROCESS WILL EMPHASIZE THE USE OF READILY AVAILABLE COMPONENTS AND PREVIOUSLY DEMONSTRATED TECHNOLOGY. PILOT SCALE PROCESS STUDIES WILL ALLOW THE ECONOMIC FACTOR OF FULL SCALE PRODUCTION TO BE EVALUATED. THIS PROJECT WILL ALSO INCLUDE PRODUCT CHARACTERIZATION AS NEEDED TO OPTIMIZE PROCESSING VARIABLES AND ASSURE QUALITY CONTROL.

XFORM INC
1223 PEOPLES AVE - BLDG-J
TROY, NY 12180
Program Manager: RENE M COOPER
Contract #:
Title: UPSCALED SELF-PROPAGATING HIGH TEMPERATURE SYNTHESIS (SHS)/DYNAMIC COMPACTION PROCESSING
Topic #: A90-302 Office: BRL ID #: 42079

THIS PROPOSAL IS FOR THE PRODUCTION OF MONOLITHIC LOW POROSITY TiC AND TiB2 USING ELEMENTAL POWDERS TO GENERATE THE COMPOUND VIA EXOTHERMAL SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS (SHS). ALONG WITH COMPOUND SYNTHESIS, THE EXCESS HEAT WILL BE USED FOR DENSIFICATION AND NET SHAPING THROUGH THE APPLICATION OF AN EXTERNAL STRESS, BY DYNAMIC COMPACTION (DC). THE SCHEME WILL ALLOW CONTROLLED DENSIFICATION OF THE SHS COMPACTS IN CONDUCTIVE GRANULAR GRAPHITE COMPACTION MEDIA UNDER VACUUM USING A THERMO-MECHANICAL SIMULATOR. AFTER STARTING THE SHS REACTION, THE GRANULAR MEDIA WILL BE LOADED AT HIGH STRAIN RATES, WITH CONTROLLED TIME DELAYS, STRAINS, STRESSES, DENSITIES, AND LOADS. IT WILL ALLOW MEASUREMENT OF DENSIFICATION VERSUS TEMPERATURE, STRAIN RATE, AND STRESS. THIS GIVES THE ADVANTAGE OF SEPARATING THE SHS PARAMETERS FROM THE DC PARAMETERS, WHILE ALLOWING RAPID HEATING, THERMAL BOOSTING, DEGASSING, AND GIVING PLANAR FRONT INITIATION OF THE REACTION. THIS WILL GIVE A RAPID, PRESSURE-ASSISTED CONSOLIDATION TECHNIQUES THAT MINIMIZES PRODUCTION PROBLEMS THROUGH STATISTICAL DESIGN OF EXPERIMENTS PIVOTED AROUND THE BASIC SHS/DC PROCESS. IT WILL PROVIDE A BASIS FOR MANUFACTURING BOTH TiC AND TiB2 IN LARGE QUANTITIES, ENABLING RAPID ASSESSMENT OF THE LATENT APPLICATIONS FOR THESE COMPOUNDS BY MAKING AVAILABLE LOW COST, HIGH QUALITY MATERIALS.

POLYMICRO TECHNOLOGIES INC
3035 N 33RD DR
PHOENIX, AZ 85017
Program Manager: DR DILIP K NATH
Contract #:
Title: HIGH PERFORMANCE ULTRAVIOLET THROUGH INFRARED OPTICAL FIBER SYSTEM
Topic #: A90-303 Office: BRL ID #: 42080

OPTICAL FIBERS CAN BE DEVELOPED TO TRANSMIT INTENSE LASER RADIATION THROUGH SELECTIVE CHOICE OF MATERIALS AND DESIGN PARAMETERS FOR THE FIBERS IN THE WAVELENGTH RANGE OF 0.193-10.6 MICRON. THESE FIBERS CAN BE INCORPORATED INTO DELIVERY SYSTEMS FOR PROGRAMMED DELIVERY OF LASER ENERGY AND INTEGRITY VERIFICATION. THE PRESENT PROPOSAL DESCRIBES A PHASE I FEASIBILITY STUDY PROGRAM COMPRISING THE DEVELOPMENT OF A DEDICATED SILICA CORE 0.22 NA FIBER SOURCE SPECIFIALLY TO BE EMPLOYED FOR THE TRANSMISSION OF INTENSE LASER RADIATION AT WAVELENGTHS 0.193-2.0 MICRON, A TRADE STUDY OF TECHNOLOGIES FOR DESIGN OF THE ELECTRO-OPTIC MODULE, AND THE CONSTRUCTION OF A LABORATORY PROTOTYPE DISTRIBUTOR AS WELL AS AN

INTEGRITY VERIFICATION SYSTEM. THE STUDY WILL BE SUPPLEMENTED BY CRITICALLY REVIEWING OPTICAL FIBER MATERIALS SUITABLE AT 10.6 MICRON AND STATE-OF-THE-ART TECHNIQUES FOR POLISHING THE END SURFACES OF THE FIBER.

ADELMAN S ASSOCS
PO BOX 9395
ARLINGTON, VA 22209
Program Manager: S ADELMAN
Contract #:
Title: PROJECTILE YAW SENSING TECHNOLOGY
Topic #: A90-304 Office: BRL ID #: 42081

THE COLLECTION OF IN-FLIGHT YAW AND SPIN MOTION INFORMATION FOR PROJECTILES IS CRITICAL TO THE EVALUATION OF SYSTEM PERFORMANCE. PRIOR TO THE ACTUAL MANUFACTURING AND TESTING OF A NEW OR IMPROVED PROJECTILE DESIGN, THE AERODYNAMIC COEFFICIENTS USED IN THE TRA- JECTORY SIMULATIONS ARE GENERATED WITH THE USE OF SEMI-EMPIRICAL CODES. THE ACCURACY OF THESE CODES DEPENDS UPON THE DEGREE TO WHICH THE NEW DESIGN DEVIATES FROM THE EXISTING DESIGNS. AS THE FINAL STEP, THE PROJECTILE CONFIGURATION IS BUILT AND TESTED TO DETERMINE THE ACTUAL AERODYNAMIC CHARACTERISTICS. PRECISE MEASUREMENT OF SPIN RATE AND YAW ARE CRITICAL TO THE DESIGN PROCESS. THIS IN-FLIGHT YAW AND SPIN MOTION MEASUREMENT OF ARTILLERY SHELLS AND OTHER MUNITIONS IS FREQUENCY ACCOMPLISHED BY THE USE OF OPTICAL SENSING AND STANDARD RADIO-FREQUENCY TELEMETRY TECHNIQUES. THE STANDARD SYSTEM THAT IS USED SENSES THE PASSAGE OF THE SUN AS THE PROJECTILE SPINS AND IS CALLED A YAWSONDE. THIS METHOD IS OBVIOUSLY RESTRICTED BY WEATHER CONDITIONS AND THE TIME WINDOW, BASED UPON DIRECTION OF FIRE, QUADRANT ELEVATION AND EPHEMERIS DATA, IN WHICH IT CAN OPERATE. THE TECHNIQUE THAT IS DESCRIBED IN THIS PROPOSAL USES A SINGLE STANDARD RATE GYROSCOPE OR ACCELEROMETER OF THE TYPE THAT IS HARDENED AND PROVEN FOR USE IN GUIDED ARTILLERY MUNITIONS TO CHARACTERIZE ALL OF THE REQUIRED MOTIONS WITH GREATER VERSATILITY THAN THE CURRENT YAWSONDE.

Q-DOT INC
1069 ELKTON DR
COLORADO SPRINGS, CO 80907
Program Manager: THOMAS E LINNENBRINK
Contract #:
Title: AEROBALLISTIC DATA ACQUISITION SYSTEM (ADACS)
Topic #: A90-305 Office: BRL ID #: 42082

Q-DOT PROPOSES TO DEVELOP A COMPREHENSIVE AEROBALLISTIC DATA ACQUISITION SYSTEM (ADACS) TO REPLACE SPIN BOXES OR YAW CARDS ON THE BALLISTIC TEST RANGE. THE FULLY AUTOMATIC ADACS WILL ELIMINATE LABOR-INTENSIVE AND TIME-CONSUMING STEPS BETWEEN SHOTS WHILE IMPROVING ACCURACY OVER CURRENT METHODS. IN ADDITION TO SPIN DATA, ATTITUDE, AND VELOCITY DATA ARE ACQUIRED BY THE SAME EQUIPMENT. THE HEART OF THE PROPOSED ADACS IS A UNIQUE, HIGH-SPEED LINE IMAGER. EACH LINE COMPRISES UP TO 1024 PIXELS. THE IMAGER HAS ON-CHIP STORAGE FOR UP TO 512 LINES OF DATA. IT CAN ACQUIRE LINES AT RATES UP TO 1,000,000 LINES/SECOND. THE IMAGER IS SELF-TRIGGERING: IT DETECTS THE INTRUSION OF A PROJECTILE INTO THE SCENE AND COMMENCES DATA STORAGE, INCLUDING SEVERAL LINES BEFORE THE TRIGGERING EVENT. WITH ON-SITE, POST ACQUISITION SIGNAL PROCESSING, SPIN CAN BE RESOLVED TO 0.1% FROM 10 TO 250 rps, ATTITUDE TO 0.1 DEG TO 10 DEG, AND VELOCITY TO 0.1% FROM 50 TO 2,220 m/sec.

SYSTEMS & PROCESSES ENGR CORP (SPEC)
1406 SMITH RD

AUSTIN, TX 78721
Program Manager: ROBERT C CHIN
Contract #:
Title: LASER REMOTE SENSING OF CLANDESTINE DRUG FACILITIES
Topic #: A90-306 Office: ASL ID #: 42094

SPEC HAS DEVELOPED AN INNOVATIVE LASER REMOTE PHASE-RESOLVED FLUORESCENCE SPECTROSCOPY (PRFS) TECHNOLOGY FOR THE DETECTION OF CLANDESTINE DRUG FACILITIES. THE TECHNOLOGY IS CAPABLE OF DETECTING ORGANIC SPECIES SUCH AS KEROSENE FILMS ON THE GROUND AND ON THE SURFACES OF RIVERS, STREAMS OR LAKES AND CAN DISTINGUISH THESE FILMS FROM OTHER PETROLEUM SLICKS. THE PRESENCE OF KEROSENE IN THESE WATERWAYS IS ATTRIBUTED TO THE FLUSHING AND DISPOSAL OF THIS SOLVENT FROM THE COCAINE PROCESS. ADVANTAGES OF THIS TECHNIQUE OVER DIRECT CHEMICAL VAPOR DETECTION ARE: CHEMICAL VAPOR DETECTION IN JUNGLE SETTINGS HAS TRADITIONALLY BEEN DIFFICULT DUE TO TERRAIN AND INTERFERENCES (METHANE FOR EXAMPLE). MOST PROCESSING CHEMICALS HAVE HIGH VAPOR PRESSURES, HEAVIER THAN AIR. THIS CAUSES THE MAJORITY OF THE VAPORS TO REMAIN CLOSE TO THE GROUND, WITH LITTLE OR NO CONCENTRATION OVER THE JUNGLE CANOPY. FINALLY, FLUORESCENCE TECHNIQUES ARE MUCH MORE SENSITIVE THAN TRADITIONAL ABSORPTION SYSTEMS (DIAL, RAMA, ETC...). THE PHASE I PROGRAM WILL PROVIDE: SYSTEM DEVELOPMENT AND EVALUATION, FLUORESCENCE CHARACTERIZATION IN ENVIRONMENTS, PRFS SYSTEM DESIGN, SIMULATION AND LABORATORY DEMONSTRATION, AND A PROTOTYPE DESIGN AND DEVELOPMENT PLAN.

PACIFIC-SIERRA RESEARCH CORP
12340 SANTA MONICA BLVD
LOS ANGELES, CA 90025
Program Manager: DR TILL LIEPMANN
Contract #:
Title: REFLECTOMETER DESIGN STUDY AND CONCEPT DEMONSTRATION
Topic #: A90-307 Office: ASL ID #: 42095

PSR WILL PRODUCE A DETAILED DESIGN AND SMALL SCALE BRASSBOARD PROOF OF CONCEPT HARDWARE VERSION OF A FIELD PORTABLE, MONOSTATIC BIDIRECTIONAL REFLECTOMETER (MR). THE PROPOSED FAR-FIELD REFLECTOMETER WILL BE BROADBAND (UV TO MMW) AND ACHROMATIC, WILL ALLOW FLEXIBILITY IN THE CHOICE OF SOURCES AND DETECTORS, AND WILL BE ABLE TO ACCOMMODATE ALL THE PARAMETERS (E.G., ASPECT ANGLE, SAMPLING SIZE AND DISTRIBUTION, POLARIZATION, SURFACE ROUGHNESS) REQUIRED TO PERFORM SUCH A MEASUREMENT. THE DESIGN STUDY WILL INCLUDE A COMPLETE ANALYSIS AND PRIORITIZATION OF THESE PARAMETERS, THE DETERMINATION OF THE RANGE OVER WHICH THEY NEED TO BE MEASURED, AND THE RESOLUTION TO WHICH THEY NEED TO BE MEASURED. THE APPARATUS REQUIRED TO ACHIEVE THESE REQUIREMENTS WILL BE DESIGNED. THIS DESIGN STUDY WILL ADDRESS THE RANGE OF REFLECTANCES EXPECTED IN THE MEASUREMENT, DETERMINE THE REQUIRED SYSTEM SENSITIVITY, AND PRODUCE A LIST OF SOURCE/DETECTOR COMBINATIONS IN THE ULTRAVIOLET (UV) THROUGH MILLIMETER WAVE (MMW) ELECTROMAGNETIC WAVELENGTHS. THE SYSTEM WILL CONSIST OF SEVERAL MONOSTATIC REFLECTOMETERS, EACH COVERING A PORTION OF THE WIDE SPECTRUM REQUIRED. CALIBRATION METHODS AND STANDARDS WILL BE IDENTIFIED, AND THE DATA ACQUISITION ARCHITECTURE WILL BE DETERMINED. IN ADDITION, THE ARCHIVING AND DATA PRESENTATION FORMAT WILL BE DESCRIBED. BECAUSE PSR HAS EXTENSIVE EXPERIENCE IN PRODUCTING SIMILAR MONOSTATIC REFLECTOMETERS, OUR PHASE I PROPOSAL INCLUDES DEMONSTRATION OF A SMALL BRASSBOARD PROOF OF CONCEPT MEASUREMENT SYSTEM. THIS BRASSBOARD WILL BE BUILT UP FROM PSR CAPITAL EQUIPMENT AND WILL NOT ADD MATERIALS COST TO THIS PHASE I EFFORT.

I-MATH ASSOCS INC
PO BOX 560788

ORLANDO, FL 32856
Program Manager: ALEXANDER AKERMAN III
Contract #:
Title: IMPACT OF TARGET SHADOWS ON TARGET ACQUISITION
Topic #: A90-308 Office: ASL ID #: 42096

A SHADOW MODEL IS PROPOSED THAT WILL MATE DIRECTLY WITH THE ATMOSPHERIC SCIENCE LABORATORY (ASL) TARGET ACQUISITION TACTICAL DECISION AID (TATDA). THE SHADOW'S INHERENT CONTRAST WILL BE DETERMINED FROM EQUATIONS USING THE RATIO OF SOLAR TO SKY ILLUMI- NATION. THE SHADOW SIZE WILL BE CHARACTERIZED BY A MINIMUM CRITICAL DIMENSION EQUIVALENT TO THE NVL MODEL METHODOLOGY ALREADY EMBEDDED IN THE TATDA SYSTEMS PERFORMANCE MODULE. THE MINIMUM CRITICAL DIMENSION WILL BE MEASURED FROM AN ACTUAL SHADOW GENERATED BY BOX- LIKE REPLICAS OF THE VARIOUS TARGETS OF INTEREST. THIS PROVIDES A LEVEL OF FIDELITY CONSISTENT WITH THE REST OF THE TATDA WHILE MINIMIZING COMPUTER TIME AND SPACE. THE SHADOWS WILL BE GENERATED USING AN ENHANCED VERSION OF THE GOVERNMENT-OWNED LASERX MODEL. BOTH PRINTER ND VIDEO TERMINAL OUTPUTS WILL INCLUDE A VISUALIZATION OF THE TARGET AND ITS SHADOW. ALL THE ABOVE ATTRIBUTES ARE SUN ANGLE DEPENDENT, AS IS A TEST FOR SHADOW OCCURRENCE, WHICH DEPENDS UPON CLOUD FREE LINES OF SIGHT BETWEEN THE TARGET AND THE SUN. WHEN ADDED TO THE TATDA, THE SHADOW MODEL WILL PROVIDE THE CAPABILITY FOR PREDICTING THE PROBABILITY OF DETECTION/RECOGNITION FOR THE TARGET AND/OR ITS SHADOW.

PACIFIC-SIERRA RESEARCH CORP
1401 WILSON BLVD - STE 1100
ARLINGTON, VA 22209
Program Manager: MICHAEL R SNAPP
Contract #:
Title: IMPACT OF SCENE SHADOWS ON TARGET ACQUISITION
Topic #: A90-309 Office: ASL ID #: 42097

ARMY TARGET ACQUISITION TACTICAL DECISION AIDS (TATDAs) FOR VISUAL AND NEAR-INFRARED (IR) SYSTEMS (WHICH INCLUDE DIRECT VIEW OPTICS (DVOs), IMAGE INTENSIFIERS (II), AND SILICON TELEVISION (SiTV) DEVICES) HAVE NO PROVISIONS TO TREAT THE EFFECTS OF EITHER SOLAR OR LUNAR SHADOWS CAST BY TARGETS OR OTHER SCENE FEATURES. SHADOWS MAY WELL INCREASE ACQUISITION RANGE BY PROVIDING ADDITIONAL TARGET CUES, OR THEY MAY DECREASE RANGE BY MASKING THE TARGET OR INCREASING CLUTTER. THIS SBIR PROPOSAL EXAMINES SCENE SHADOW EFFECTS ON TARGET ACQUISITION RANGE PREDICTION. IT INCLUDES NOT ONLY SOLAR SHADOWS, BUT ALSO LUNAR SHADOWS BECAUSE OF THEIR EFFECTS ON NEAR-IR NIGHT VISION DEVICES. THE TECHNICAL OBJECTIVES OF THE SBIR ARE TO DEVELOP A GEOMETRICAL SCENE SHADOW ALGORITHM FOR INCORPORATION IN THE VISUAL AND NEAR-IR PORTION OF ASL'S TATDA AND FOR LATER USE IN VISUALIZATION SCHEMES; DEFINE SHADOWING EFFECTS PRODUCED BY CLOUDS, LARGE-SCALE SCENE FEATURES, AND SMALL-SCALE (I.E., CLUTTER) SCENE FEATURES; DEFINE ANY MODIFICATIONS (E.G., SOLAR/LUNAR GEOMETRY, CONTRAST TRANSMISSION, SCENE GEOMETRY) REQUIRED TO EXISTING TATDA SOFTWARE IN ORDER TO ACCOUNT FOR SHADOWS; AND DEFINE VISUALIZATION MODEL REQUIREMENTS FOR SHADOW PARAMETERS.

SIGMA RESEARCH CORP
234 LITTLETON RD - STE 2E
WESTFORD, MA 01886
Program Manager: DR ROBERT J YAMARTINO
Contract #:
Title: FOUR DIMENSIONAL MESOSCALE NON-GAUSSIAN MULTISPECTRAL SMOKE MODEL
Topic #: A90-310 Office: ASL ID #: 42098

THERE IS A GROWING NEED FOR A MULTISPECTRAL SMOKE DISPERSION MODEL THAT CAN RAPIDLY EVALUATE CONCENTRATIONS OF DIFFUSING OBSCURANT CLOUDS USING THE MODEST RESOURCES OF A PERSONAL COMPUTER. AS DIFFERENT SIZE SMOKE PARTICLES DIFFER IN THEIR LIGHT SCATTERING PROPERTIES AND THEIR SURFACE DEPOSITION RATE, THE PROPOSED MONTE CARLO LAGRANGIAN DISPERSION MODEL WILL SIMULTANEOUSLY CONSIDER A NUMBER OF PARTICLE SIZE CLASSES AS WELL AS THE INITIAL SPECTRUM OF PARTICLE DIAMETERS. THE PROPOSED DISPERSION MODEL WILL INCLUDE STATE-OF-THE-ART-SCIENCE MODULES FOR LAGRANGIAN TURBULENCE ESTIMATION, PARTICLE VELOCITY ESTIMATION, PARTICLE TRAJECTORY GENERATION, RESISTANCE METHODOLOGY BASED DRY DEPOSITION VELOCITY ESTIMATION, AND EFFICIENT COMPUTATION OF CONCENTRATIONS AND OBSCURANT ATTENUATION. THE PROJECT'S FINAL REPORT WILL INCLUDE A LITERATURE REVIEW OF THE RELEVANT TOPICAL AREAS, DOCUMENTATION OF THE APPROACH USED IN THE VARIOUS ALGORITHMS, PRELIMINARY MODEL EVALUATION, AND RECOMMENDATIONS FOR PHASE II RESEARCH.

SIGMA RESEARCH CORP
234 LITTLETON RD - STE 2E
WESTFORD, MA 01886
Program Manager: STEVEN R HANNA
Contract #:
Title: ATMOSPHERIC BOUNDARY LAYER STABILITY ESTIMATOR FOR URBAN AREA
Topic #: A90-311 Office: ASL ID #: 42099

IN MOST U.S. ARMY ATMOSPHERIC DISPERSION MODELS, THE PASQUILL METHODOLOGY IS USED TO ESTIMATE STABILITY IN THE BOUNDARY LAYER. AS A RESULT, THERE ARE DISCONTINUITIES IN CALCULATED DISPERSION AMONG THE SIX STABILITY CLASSES. FURTHERMORE, CORRECTIONS FOR SURFACE CONDITIONS (I.E., FIELDS, URBAN AREAS, OR FORESTS) ARE ALSO DISCRETE FUNCTIONS. RECENT THEORETICAL DEVELOPMENTS PROVIDE THE BASIS FOR REVISING THIS METHODOLOGY USING PRINCIPLES OF MONIN-OBUKHOV AND CONVECTIVE SIMILARITY THEORY. AN ALGORITHM FOR DETERMINING STABILITY AS A CONTINUOUS FUNCTION IS DEVELOPED FOR USE ON A PERSONAL COMPUTER. THIS ALGORITHM REQUIRES INPUT OF BASIC OBSERVATIONS SUCH AS WIND SPEED, CLOUDINESS, SURFACE ROUGHNESS AND ALBEDO, AND MOISTURE CONTENT OF THE GROUND. THE METHODOLOGY IS SUFFICIENTLY GENERAL THAT IT IS VALID FOR ALL TYPES OF UNDERLYING SURFACES AND PRODUCES AN ESTIMATE OF STABILITY THAT IS CONTINUOUS IN TIME AND SPACE. PROFILES OF WIND, TEMPERATURE, AND TURBULENCE CAN ALSO BE READILY CALCULATED BY THIS ALGORITHM, FOR DIRECT USE IN DISPERSION MODELS.

TECHNOCHEM CO
203-A CREEK RIDGE RD
GREENSBORO, NC 27406
Program Manager: DR SHYAM D ARGADE
Contract #:
Title: CATHODES FOR MOLTEN SALT LITHIUM BATTERIES
Topic #: A90-312 Office: ETDL ID #: 42083

MOLTEN SALT LITHIUM BATTERIES OFFER THE PROSPECT OF VERY HIGH PULSE POWER DENSITIES COUPLED WITH HIGH SPECIFIC ENERGY DENSITIES. FOR PULSE POWER APPLICATION, U.S. ARMY REQUIRES PROJECTED CURRENT DENSITIES OF HUNDREDS OF AMPERES PER SQ.CM. IN THE MILLISECOND RANGE AND TENS OF AMPERES PER SQ.CM. IN THE FRACTIONS OF SECOND. CATHODES FOR SUCH MOLTEN-SALT LITHIUM BATTERIES MUST HAVE HIGH THEORETICAL ENERGY DENSITY AND GOOD REACTION RATES. PROPOSED PHASE I PROGRAM OBJECTIVES ARE ORIENTED TOWARDS IDENTIFYING AND DEVELOPING CATHODE MATERIALS WHICH CAN OPERATE IN A RECHARGEABLE LITHIUM MOLTEN-SALT BATTERY FOR DELIVERING EXCEEDINGLY HIGH PULSE POWER LEVELS. THESE NOVEL CATHODE MATERIALS ARE EXPECTED TO YIELD OPERATING CELL VOLTAGES OF 1 VOLT HIGHER THAN THOSE FOR THE LITHIUM/METAL SULFIDE HIGH TEMPERATURE SYTEMS. PHASE I PROGRAM CONSISTS OF STUDYING

ELECTRO- CHEMISTRY OF A VARIETY OF PROMISING CANDIDATE MATERIALS IN THE LiCl-KCl MOLTEN SALTS. THE CHEMICAL AND ELECTROCHEMICAL STABILITY OF THESE CATHODE MATERIALS WILL ALSO BE INVESTIGATED. CELL STUDIES WITH TWO MOST PROMISING CATHODE MATERIALS WILL BE CARRIED OUT TO ESTABLISH THE RECHARGEABILITY, DISCHARGE PULSE POWER PERFORMANCE AND CHARACTERIZATION UNDER REPETITAVE PULSING REGIMES. SUCCESSFUL COMPLETION OF THIS PROGRAM WILL FORM THE BASIS FOR A PHASE II PROGRAM IN WHICH DESIGN, FABRICATION AND TESTING OF A BATTERY PROTOTYPE IS ENVISAGED.

PHONON CORP
PO BOX 549 - 7 HERMAN DR
SIMSBURY, CT 06070
Program Manager: RAY SAWIN
Contract #:
Title: RESONATOR AGING REDUCTION VIA LANGMUIR - BLODGETT FILMS
Topic #: A90-313 Office: ETDL ID #: 42084

CRYSTAL RESONATOR OSCILLATORS ARE COMMONLY USED FOR TIMING AND FREQUENCY CONTROL APPLICATIONS IN BOTH COMMERCIAL AND MILITARY SYSTEMS SUCH AS COMPUTERS, INSTRUMENTS, SPACECRAFT, RADIOS, ECCM, IFF, NAVIGATION, AND SURVEILLANCE MEASURES. HIGH STABILITY IS ABSOLUTELY ESSENTIAL TO SYSTEM INTEGRITY. RESONATOR AGING IS A MAJOR PROBLEM IN DEGRADING SYSTEM PERFORMANCE. TREMENDOUS COSTS ARE INCURRED DUE TO THE ADDITIONAL REQUIRED MAINTENANCE, REFURBISHMENT, ETC. IT IS A RECENT CONCEPT THAT RESONATOR AGING MAY BE SLOWED BY REDUCING MASS TRANSFER DUE TO ADSORPTION-ABSORPTION OF CONTAMINANT MATERIAL. LANGMUIR-BLODGETT (L-B) FILMS ARE MONO LAYER FILMS CAPABLE OF PREVENTING THE TRANSFER OF CERTAIN MATERIALS. IT IS PROPOSED THAT SPECIFICALLY TAILORED L-B FILMS BE APPLIED TO A RESONATOR STRUCTURE AND EVALUATED FOR MASS TRANSFER VIA ADSORPTION-ABSORPTION. ADDITIONALLY, A NOVEL APPROACH IS PROPOSED FOR OBTAINING FAST AGING DATA WITH A QUARTZ, NARROW BAND, SURFACE ACOUSTIC WAVE (SAW) BANDPASS FILTER OF REFLECTIVE MODE DESIGN. THIS TYPE OF FILTER EXHIBITS THE SAME AGING TREND AS THE COMMONLY USED BULK QUARTZ RESONATOR OR HIGH Q SAW QUARTZ RESONATOR. HOWEVER, BECAUSE OF ITS REFLECTIVE MODE DESIGN AND INHERENT SURFACE-SENSITIVE NATURE, SPECTRAL CHARACTERISTICS ARE HYPER-SENSITIVE TO MASS TRANSFER PHENOMENA. HENCE AGING OF THIS TYPE IS READILY VISBLE, ALLOWING FOR AN ACCELERATED PROGRAM. ALSO, VERY IMPORTANTLY, MANY SAW DEVICES CAN BE PRODUCED FROM A SINGLE WAFER, THUS SHARING "SAME" PROCESS VARIABLES AND EASILY ISOLATED VARIABLES.

ADVANCED TECHNOLOGY MATERIALS INC
520-B DANBURY RD
NEW MILFORD, CT 06776
Program Manager: DR PETER S KIRLIN
Contract #:
Title: MOCVD OF HTSC: PROCESS DEVELOPMENT FOR UNIFORM LARGE AREA GROWTH
Topic #: A90-314 Office: ETDL ID #: 42085

SEVERAL METHODS, INCLUDING SPUTTERING, E-BEAM EVAPORATION, LASER ABLATION AND METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD), HAVE SUCCEEDED IN DEPOSITING HIGH QUALITY THIN FILMS OF HIGH TEMPERATURE SUPERCONDUCTORS (HTSC) ON 1 CM2 SUBSTRATES. HOWEVER, THE GROWTH OF HIGH QUALITY THIN FILMS OVER LARGE AREAS HAS YET TO BE ACHIEVED AND PROCESS REPRODUCIBILITY IS MARGINAL. THESE TWO SHORTCOMINGS ARE THE MAJOR REMAINING BARRIERS TO THE COMMERCIAL PRODUCTION OF PASSIVE HTSC COMPONENTS. BASED ON WORK DONE IN THE GROWTH OF COMPOUNT SEMI- CONDUCTORS, MOCVD HAS EMERGED AS THE PREEMINENT DEPOSITION METHOD FOR THE GROWTH OF UNIFORM FILMS OVER LARGE AREAS. THE MOST UNIFORM FILMS GROWN BY MOCVD HAVE BEEN DEPOSITED UNDER STAGNATION POINT FLOW. ATM IS CURRENTLY GROWING

STATE-OF-THE-ART TlBaCaCuO THIN FILMS BY MOCVD IN A STAGNATION POINT FLOW REACTOR WHICH IS CAPABLE OF HANDLING 3 INCH DIAMETER SUBSTRATES. THE GOAL OF PHASE I IS TO USE A COMBINED MODELING/EMPIRAL APPROACH TO DEVELOP CVD HARDWARE AND OPERATING CONDITIONS WHICH GIVE UNIFORM Ba(2)CaCu(2)O(x) FILMS. IN PHASE II, THE CONCERTED APPROACH WILL BE EXTENDED TO THE CVD OF Tl(2)Ca(2)CaCu(2)O(x) WITH A TARGETED THICKNESS AND COMPOSITIONAL UNIFORMITY MILESTONE OF LESS THAN + OR - 5% OVER 3 INCH DIAMETER SUBSTRATES. A SECONDARY OBJECTIVE IS THAT UNIFORM GROWTH TAKE PLACE UNDER CONDITIONS WHICH ARE HIGHLY TOLERANT OF SMALL FLUCTUATIONS IN THE PROCESS PARAMETERS TO ENSURE A LEVEL OF PROCESS REPRODUCIBILITY TYPICAL OF THE ELECTRONICS INDUSTRY.

AERO-SMITH SYSTEMS INC
2196 SIERRA VENTURA DR
LOS ALTOS, CA 94024
Program Manager: THOMAS S SMITH JR
Contract #:
Title: COLLISION AVOIDANCE SYSTEMS FOR LOW FLYING AIRCRAFT
Topic #: A90-315 Office: ETDL ID #: 42086

LOW FLYING MILITARY AIRCRAFT ARE ENDANGERED BY TERRAIN OBSTACLES AND OTHER AIRCRAFT. A MEANS TO SENSE THE DIRECTION, CLOSURE RATE AND DISTANCE TO THESE OBSTACLES IS NEEDED TO ENHANCE SAFETY. THE FOCUS OF THIS STUDY WILL BE ON AN AUTONOMOUS, HIGHLY INTEGRATED, DOPPLER SENSOR/SYSTEM COMPOSED OF ONLY 3 TO 5 CHIPS WHICH DETECT ALTITUDE AND THE DISTANCE, BEARING, AND CLOSURE RATE OR TIME-TO-IMPACT TO THREATING OBSTACLES. THE SENSORS CAN BE CONFIGURED TO PROVIDE FULL HEMISPHERICAL COVERAGE AGAINST OTHER AIRCRAFT ABOVE AND BELOW THE PROTECTED AIRCRAFT AT ALTITUDES ABOVE 200 FEET AGL. BELOW 200 FEET THE LOWER SENSOR CAN SWITCH TO A FORWARD SCANNING, NARROW BEAM TO DETECT OBSTACLES IN ITS FLIGHT PATH. MAXIMIZING INTEGRATION OF CIRCUITS AND ANTENNAS FOR BOTH MILITARY AND COMMERCIAL APPLICATIONS WILL BE A HIGH PRIORITY. A VARIETY OF MICROWAVE/MILLIMETER SENSORS WILL BE STUDIED TO DETERMINE THE OPTIMUM DESIGN WHICH IS EFFECTIVE, SMALL, LIGHT, AND LOW-COST. THIS STUDY WILL BE CONDUCTED TO DETERMINE THE OPTIMUM FREQUENCY(S), OUTPUT POWER, MODULATION, AND SCANNING METHODS FOR ACHIEVING THE RESOLUTION NEEDED TO DISCERN THE THREATENING OBSTACLES. SENSOR COMPONENTS WILL BE DEFINED FOR A COMPLETE SYSTEM CAPABLE OF ALERTING THE PILOT IN A TIMELY AND EFFECTIVE MANNER.

COMPACT SOFTWARE INC
483 McLEAN BLVD & 18TH AVE
PATERSON, NJ 07504
Program Manager: WALTER GHIJSEN
Contract #:
Title: MICROWAVE HARDWARE DESCRIPTIVE LANGUAGE
Topic #: A90-316 Office: ETDL ID #: 42087

WE PROPOSE A DESIGN AND PRELIMINARY SPECIFICATION FOR A MICROWAVE HARDWARE DESCRIPTIVE LANGUAGE IN WHICH ALL BEHAVIORAL ASPECTS OF MICROWAVE DESIGN CAN BE DOCUMENTED. THE PURPOSE OF THE MHDL IS DEFINED BASED ON A SURVEY OF EXISTING DOCUMENTATION TECHNIQUES AND EXISTING NEEDS. FURTHERMORE THE ROLE OF MHDL WITH RESPECT TO DESIGN TOOLS AND EDIF IS DESCRIBED. THE LANGUAGE DESCRIBES THE MECHANISMS THAT ARE USED TO SPECIFY THE BEHAVIOR OF A SYSTEM. THE PROPOSED EFFORTS EMPHASIZE THE IMPLEMENTATION OF THE LANGUAGE. TO THIS END, A PRELIMINARY SPECIFICATION OF A MHDL IS DEVELOPED.

ALTERNATIVE SYSTEM CONCEPTS
2 INWOOD CIR

PELHAM, NH 03076
Program Manager: CARL A KARRFALT
Contract #:
Title: BIST FOR OTS AND ASIC VLSI DESIGNS WITH VHDL
Topic #: A90-317 Office: ETDL ID #: 42088

THE EMERGENCE OF VLSI TECHNOLOGY HAS INCREASED THE COMPLEXITY OF INTEGRATED CIRCUIT DEVICES, IN TERMS OF TRANSISTORS PER DEVICE, AT A RATE MULTIPLYING BY 100 EVERY 10 YEARS. NEW TECHNOLOGIES, SUCH AS SURFACE MOUNT, REQUIRE SPECIAL TECHNIQUES TO MAKE THE BOARDS TESTABLE. THE GOAL OF THIS RESEARCH AND DEVELOPMENT PROJECT IS TO REVIEW RELATED RESEARCH AND DEVISE VARIOUS WAYS TO SEMIAUTOMATICALLY ADD BUILT-IN-SELF-TEST (BIST) TO EXISTING DESIGNS -- AT THE SYSTEM, BOARD AND A MIXTURE OF CUSTOMIZABLE AND NON-CUSTOMIZABLE DEVICES. CONSIDERATION WILL BE GIVEN TO USING MACHINE READABLE DESCRIPTIONS (NET LISTS AND BEHAVIORAL MODELS) FOR INPUT, AND WHERE POSSIBLE, AUTOMATICALLY ADDING BIST TO OFF-THE-SHELF AND ASIC VLSI DESIGNS. INDUSTRY STANDARD VHSIC HARDWARE DESCRIPTION LANGUAGE (VHDL) AS WILL BE THE PREFERRED STANDARD FOR THE SEMIAUTOMATIC PROCESS. DURING PHASE II, GENERIC BOUNDARY SCAN TEST CIRCUITS OR OTHER TECHNIQUES AS A SUBSET OF THOSE CONSIDERED FOR PHASE I WILL BE CONSTRUCTED AND TESTED WITH SAMPLE BEHAVIORAL AND STRUCTURAL VHDL MODELS. COMMERCIAL SUPPLIERS OF VHDL DESIGN AUTOMATION TOOLS WILL BE INVITED TO PARTICIPATE IN FURTHER COMMERCIAL PRODUCT DEVELOPMENT. PROOF OF CONCEPT WILL ALSO BE ATTEMPTED DURING PHASE I.

ITERATED SYSTEMS INC
5550 PEACHTREE PKWY
NORCROSS, GA 30092
Program Manager: MICHAEL BARNSLEY
Contract #:
Title: FRACTAL IMAGE COMPRESSION TECHNIQUES
Topic #: A90-319 Office: ETDL ID #: 42089

DIGITAL IMAGE DATA REPRESENTATIVE OF AN ARMY APPLICATION WILL BE IDENTIFIED AND OBTAINED. THIS DATA WILL BE PROCESSED USING FRACTAL TRANSFORM TECHNOLOGY TO OBTAIN A COMPRESSED REPRESENTATION OF THE ARMY IMAGERY. THIS WILL BE ACHIEVED BY THE DEVELOPMENT OF THE ARMY FRACTAL TRANSFORM TEST SYSTEM. THE FRACTAL TRANSFORM TECHNOLOGY WILL BE COMPARED AGAINST A STANDARD CONTROL COMPRESSION TECHNIQUE BASED ON DISCRETE COSINE TRANSFORM. THE RESULTS OF THIS STUDY INCLUDING COMPRESSED IMAGE FILE SIZES, COMPUTATIONAL COMPLEXITY COMPARISONS, ARMY IMAGE FORMATS, IMAGE FIDELITY RESULTS AND IMAGE DATA WILL BE INCLUDED IN A FINAL REPORT.

MASSACHUSETTS TECHNOLOGICAL LAB INC
312 AUSTIN ST
W NEWTON, MA 02165
Program Manager: DR TA-MING FANG
Contract #:
Title: SIGNAL COMPRESSION FOR C3 APPLICATIONS USING HYPERDISTRIBUTIONS
Topic #: A90-319 Office: ETDL ID #: 42090

WE DEVELOP HERE A TECHNIQUE FOR SIGNAL COMPRESSION/DECOMPRESSION BASED ON NEW ADVANCES IN THE THEORY OF GENERALIZED FUNCTIONS. WE TERM THESE NEW MATHEMATICAL OBJECTS "GENERALIZED DISTRIBUTIONS" OR "HYPERDISTRIBUTIONS". WE PROPOSE TO DETERMINE THE COMPRESSION RATIOS WHICH MAY BE OBTAINED BY REPRESENTING IMAGE DATA IN TERMS OF A TRUNCATED HYPERDISTRIBUTION SERIES, RATHER THAN THE ORIGINAL COLLECTION OF PIXEL INTENSITIES. SPECIAL ATTENTION WILL ALSO BE GIVEN TO THE TIME REQUIRED FOR COMPRESSIONS AND

DECOMPRESSIONS IN TIME-CRITICAL SITUATIONS, AS IN BATTLEFIELD APPLICATIONS. HYPER-DISTRIBUTIONS EXHIBIT INTERESTING MATHEMATICAL PROPERTIES UNDER CONVOLUTION OPERATIONS, AND SO THE POSSIBILITY EXISTS THAT IMAGE PROCESSING OPERATIONS CAN BE COMBINED WITH SIGNAL COMPRESSION/ DECOMPRESSION, AND IN PARTICULARLY THAT PARTICULAR CLASSES OF IMAGE PROCESSING OPERATIONS MAY BE CARRIED OUT ON COMPRESSED DATA SETS, WITH CORRESPONDING GAINS IN PROCESSING TIME.

KOPIN CORP
695 MYLES STANDISH BLVD
TAUNTON, MA 02780
Program Manager: DR JACK P SALERNO
Contract #:
Title: NANOSTRUCTURES FOR OPTICAL SOURCES AND DETECTORS
Topic #: A90-321 Office: ETDL ID #: 42091

WE PROPOSE TO DEVELOP NANOSTRUCTURE InGaAsP LIGHT SOURCES AND InGaAs LIGHT DETECTORS DURING A THREE-PHASE PROGRAM. PHASE I WILL DETERMINE THE FEASIBILITY OF USING CHLORINATED CHEMISTRIES TO ENHANCE THE GROWTH OF THESE NANOSTRUCTURES. SPECIFICALLY, WE WILL INVESTIGATE AND COMPARE THE GROWTH AND PROPERTIES OF InGaAsP AND InGaAs NANOSTRUCTURES LATTICE-MATCHED TO InP SUBSTRATES BY THREE GROWTH TECHNIQUES. THESE ARE TO BE CONVENTIONAL LOW-PRESSURE OMCVD, CHLORINATED CHEMISTRY OMCVD, AND HCl-INJECTED HYDRIDE VPE. AN ASSESSMENT OF THE RELATIVE MERITS OF THESE THREE TECHNIQUES WILL BE MADE AND A PHASE II PROGRAM PLAN GENERATED. THE PHASE II PROGRAM WILL DEMONSTRATE NANOSTRUCTURE OPTOELECTRONIC DEVICES FABRICATED USING THE PREFERRED GROWTH TECHNIQUE. PHASE III WILL FOCUS ON THE COMMERCIALIZATION OF THE DEVICES DEVELOPED IN PHASE II AND IS ANTICIPATED TO BE DIRECTED TOWARD OEIC COMPONENTS MONOLITHICALLY FABRICATED USING TECHNOLOGY UNDER PARALLEL DEVELOPMENT.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
Program Manager: NASSER KARAM
Contract #:
Title: NANOSTRUCTURE DENSE QUANTUM-WIRE ARRAYS FOR ADVANCED OPTOELECTRONIC DEVICES
Topic #: A90-321 Office: ETDL ID #: 42092

WE PROPOSE TO INVESTIGATE THE PATTERNING AND OVERGROWTH OF NANOSTRUCTURE QUANTUM-WIRE ARRAYS IN THE GaAs-AlGaAs SYSTEM AND THE POTENTIAL OF THIS APPROACH FOR FABRICATING ADVANCED ELECTRONIC AND PHOTONIC DEVICES. THIS WILL BE ACHIEVED BY COUPLING LOW PRESSURE METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) WITH X-RAY NANOLITHO- GRAPHY TECHNIQUES. IN PHASE I, WE WILL STUDY THE FEASIBILITY OF FABRICATING GaAs QUANTUM WIRE ARRAYS EMBEDDED IN AlGaAs. WIRES WITH DIMENSIONS AS SMALL AS 10 nm PER SIDE AND A 200 nm PERIOD MAY BE ACHIEVED OVER LARGE AREAS USING THE HIGH RESOLUTION LATERAL DEFINITION OF X-RAY NANOLITHOGRAPHY AND THE PREFERENTIAL GROWTH OF MOCVD ON PATTERNED SUBSTRATES. WE WILL INVESTIGATE THE POTENTIAL OF THIS APPROACH FOR THE FABRICATION OF QUANTUM WIRE LASER ARRAYS WITH LOWER THRESHOLD CURRENTS, HIGHER POWER OUTPUT, BETTER EFFICIENCY, AND NARROWER LINE WIDTHS. PHASE II WILL DEAL WITH OPTIMIZATION OF THE PATTERNING/OVERGROWTH PARAMETERS FOR BETTER QUANTUM CONFINEMENT, BANDGAP ENERGY ENGINEERING, HIGHER PACKING DENSITY, AND BETTER PERFORMANCE OF THESE QUANTUM WIRE LASER ARRAYS.

CASCADE MICROTECH INC
14255 SW BRIGADOON CT

BEAVERTON, OR 97005
Program Manager: GARY HEWITT
Contract #:
Title: AUTOMATED MULTIFUNCTION MONOLITHIC (MMIC) WAFER PROBE MEASUREMENT SYSTEM
Topic #: A90-322 Office: ETDL ID #: 42093

MMIC TESTING CAN BE MORE PRODUCTIVE, ACHIEVE LOWER COST AND HIGHER THROUGH PUT WITH A MODULAR SOFTWARE APPROACH. THE COMMERCIAL DEVELOPMENT OF SINGLE CONNECTION, MULTIMEASUREMENT TEST SYSTEM FOR MMIC'S HAS BECOME FEASIBLE. THIS PROPOSAL TAKES A PLANNED SOFTWARE APPROACH TO DEVELOP THE INSTRUMENT DRIVERS FOR AN EXISTING MICRO-CAT TEST EXECUTIVE. THE PROPOSED WORK WILL DEMONSTRATE THE PRODUCTIVITY OF INSTRUMENT DRIVER AND TEST PLAN SOFTWARE DEVELOPMENT THAT CAN BE ACHIEVED WITH A WELL DISCIPLINED MODULAR SOFTWARE DESIGN APPROACH. THE PHASE II WORK PLAN ADDRESSES THE DETAILED SOFTWARE DESIGN SPECIFICATION RESULTING IN COMPLETE SOFTWARE CODE FOR KEY INSTRUMENT DRIVERS, AND BROADLY REQUIRED MMIC FUNCTIONAL TEST PLANS.

PHYSICAL OPTICS CORP
20600 GRAMERCY PL - STE 103
TORRANCE, CA 90501
Program Manager: DR RAY CHEN
Contract #:
Title: OPTICAL MANIPULATION AND DISTRIBUTION OF MICROWAVE SIGNALS
Topic #: A90-323 Office: HDL ID #: 42100

WE PROPOSE A NOVEL OPTOELECTRONIC DEVICE COMBINATION AS A POWERFUL AND UNIVERSAL MEANS TO OPTICALLY MANIPULATE AND THEN DISTRIBUTE MICROWAVE SIGNALS. IN CONTRAST TO ANY KNOWN WAVEGUIDE FABRICATION METHOD SUCH AS ION-EXCHANGE, METAL-INDIFFUSION, OR MOLECULAR BEAM EPITAXY, WE PROPOSE A REFRACTIVE INDEX TUNING METHOD TO CONSTRUCT A LOW COST POLYMER WAVEGUIDE ON ANY SURFACE, INCLUDING SEMICONDUCTORS, CONDUCTORS, AND INSULATORS. THE TUNING METHOD WILL BE RESEARCHED DURING THE PHASE I PROGRAM TO MINIMIZE THE WAVEGUIDE PROPAGATION LOSS. PLAUSIBILITY OF GENERATING A POLYMER WAVEGUIDE MODULATOR AND FABRICATING MICROPRISMS (~ 100 um) OF ARBITRARY SHAPES WILL ALSO BE DEMONSTRATED. THE PROPOSED MODULATOR HAS A SIMILAR ELECTRODE STRUCTURE TO THAT OF A TRAVELING WAVE DEVICE; THEREFORE, ULTRA-HIGH SPEED IS EXPECTED. THE PROPOSED CONCEPT IS AN EXTREMELY POWERFUL TOOL FOR INTRACHIP, CHIP-TO-CHIP, AND BOARD-TO-BOARD HIGHLY PARALLEL INTERCONNECTS (E.G., FIBER OPTIC DELAY LINES FOR PHASED ARRAY ANTENNAS). THERE IS CURRENTLY NO PRACTICAL WAY TO COUPLE LIGHT FROM SINGLE-MODE WAVEGUIDES TO MULTI-MODE FIBERS (50/125,62.5/125,100/140). THE POLYMER WAVEGUIDE/MICROPRISM ARRAY APPROACH CAN SOLVE THIS INTERFACE PROBLEM. AN INTERCONNECTION SYSTEM SUITABLE FOR ARMY PHASED ARRAY ANTENNAS WILL BE INVESTIGATED IN PHASE I AND THEN DEVELOPED IN PHASE II AND III.

DISPLAYTECH INC
2200 CENTRAL AVE - STE A
BOULDER, CO 80301
Program Manager: MARK A HANDSCHY
Contract #:
Title: IMPROVED SLM FOR ADVANCED OPTICAL SIGNAL PROCESSING
Topic #: A90-324 Office: HDL ID #: 42101

THE PROPOSED WORK AIMS TO DEVELOP MULTI-LEVEL OR ANALOG SPATIAL LIGHT MODULATORS (SLMs) THAT INTEGRATE PHOTODETECTORS AND ELECTRONIC INTER- AND INTRA-CELL PROCESSING. WE WILL INVESTIGATE A VARIETY OF ANALOG OPTICAL MODULATION EFFECTS IN FERROELECTRIC LIQUID CRYSTALS (FLCs), AND WE WILL DEVELOP APPROPRIATE MULTI-LEVEL ELECTRONIC DRIVING SCHEMES

SUITABLE FOR IMPLEMENTATION IN VERY LARGE SCALE INTEGRATED CIRCUITS. FABRICATION OF PROOF-OF-CONCEPT SLMs WITH THE FLC LIGHT MODULATING LAYER DIRECTLY ATOP CUSTOM-MADE INTEGRATED CIRCUITS WILL DEMONSTRATE THE FEASIBILITY OF A VERSATILE, ECONOMICAL TECHNOLOGY FOR HIGH FRAME RATE (10 kHz) SLMs. THESE SLMs WILL ALLOW COMPACT, REAL-TIME OPTICAL IMPLEMENTATION OF SOPHISTICATED NEURAL NETWORK MODELS OF HUMAN VISION.

NAVSYS CORP & 3C SYSTEMS
18725 MONUMENT HILL RD
MONUMENT, CO 80132
Program Manager: MARK STURZA
Contract #:
Title: ECM RESISTANT GLOBAL POSITIONING SYSTEM (GPS) RECEIVER
Topic #: A90-325 Office: HDL ID #: 42102

GPS IS PLANNED TO BE USED BY THE U.S. ARMY IN A VARIETY OF TACTICAL SCENARIOS. FIRE CONTROL APPLICATIONS ARE CURRENTLY BEING INVESTIGATED WHERE GPS WOULD BE USED TO TRACK REGISTRATION ROUNDS AND LOCATE RADIOSONDES. SINCE GPS IS A RADIONAVIGATION SYSTEM, ITS EFFECTIVENESS IN A TACTICAL ENVIRONMENT IS LIMITED BY ITS SUSCEPTIBILITY TO ELECTRONIC COUNTERMEASURES(ECM). IT IS PARTICULARLY DIFFICULT TO TRACK A HIGH-DYNAMIC PLATFORM, SUCH AS A REGISTRATION ROUND OR FIGHTER AIRCRAFT, IN THE PRESENCE OF A JAMMER DUE TO THE LARGE SIGNAL PROCESSING BANDWIDTH REQUIRED TO ACCOMMODATE THE SIGNAL DOPPLER SHIFT. THIS PROPOSAL DESCRIBE THE DEVELOPMENT OF DIGITAL SIGNAL PROCESSING (DSP) ALGORITHMS THAT WILL ENHANCE THE ECM RESISTANCE OF A TACTICAL GPS RECEIVER. AN INNOVATIVE "SOFTWARE" RECEIVER ARCHITECTURE IS DESCRIBED THAT WILL BE USED TO IMPLEMENT THESE ALGORITHMS IN PHASE II. THE SOFTWARE RECEIVER TAKES ADVANTAGE OF THE DEVELOPMENT OF HIGH-SPEED DSP MICROPROCESSORS WHICH ARE CAPABLE OF PERFORMING REAL-TIME CODE AND CARRIER TRACKING ON THE 20 MHz SAMPLED P-CODE SIGNALS. THIS APPROACH WILL ALLOW MAXIMUM FLEXIBILITY IN DEVELOPING A PROOF-OF-CONCEPT ECM RESISTANT RECEIVER UNDER PHASE II AS WELL AS PROVIDING A VIABLE RECEIVER DESIGN FOR FUTURE PRODUCTION. THE ECM RESISTANT RECEIVER WILL BE CAPABLE OF TRACKING HIGH-DYNAMIC PLATFORMS UNDER HIGH JAMMING CONDITIONS. THE RECEIVER WILL ALSO BE SUITABLE FOR INTEGRATION INTO A TRANSLATOR PROCESSING SYSTEM FOR TRACKING GPS TRANSLATOR ON REGISTRATION ROUNDS.

DAMASKOS INC
PO BOX 469
CONCORDVILLE, PA 19331
Program Manager: WILLIAM J BITER
Contract #:
Title: MICROSTRUCTURAL ENGINEERED THIN FILM MATERIAL FOR EM SHIELDING
Topic #: A90-326 Office: HDL ID #: 42103

DAMASKO, INC. PROPOSES TO DEVELOP A THIN FILM SHIELDING MATERIAL WHICH WILL HAVE PROPERTIES COMBINING THE DESIRABLE FEATURES OF GOOD CONDUCTOR AND A HIGHLY MAGNETIC METAL. THE FILM WILL BE DEPOSITED ONTO A FLEXIBLE SUBSTRATE WHICH WILL ALLOW IT TO BE LAMINATED TO FORM A COMPOSITE MATERIAL WITH GOOD STRUCTURAL PROPERTIES. THIS WILL RESULT IN A LIGHTWEIGHT STRUCTURE WHICH CAN BE MADE IN COMPLEX SHAPES BY LOW COST MOLDING AND LAMINATION TECHNIQUES. THE MAGNETIC FILM, INCLUDING THE SUBSTRATE, WILL BE THIN AND CAN BE PATTERNED. BY BONDING THE FILM TO A TRANSPARENT SUPPORT, A MAGNETIC SHIELDING MATERIAL WILL BE OBTAINED WHICH IS ESSENTIALLY TRANSPARENT.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482

ALBUQUERQUE, NM 87198
Program Manager: DR EVERETT FARR
Contract #:
Title: DUAL POLARIZATION ULTRA-WIDEBAND ANTENNA
Topic #: A90-327 Office: HDL ID #: 42104

AN INVESTIGATION OF WIRE ANTENNAS IS PROPOSED TO DETERMINE AN OPTIMAL CONFIGURATION FOR A ULTRA-WIDEBAND ANTENNA. A NEW ANTENNA, THE BALANCED TRANSMISSION-LINE WAVE ANTENNA, HAS BEEN DEMONSTRATED TO HAVE DESIRABLE CHARACTERISTICS AT LOWER FREQUENCIES. IT IS PROPOSED TO EXAMINE THE FEASIBILITY OF THIS ANTENNA AT HIGHER FREQUENCIES.

SCITEQ ELECTRONIC INC
8401 AERO DR
SAN DIEGO, CA 92123
Program Manager: ALLAN EDWIN
Contract #:
Title: DIGITAL WAVEFORM GENERATION
Topic #: A90-328 Office: HDL ID #: 42105

SCITEQ WILL DESIGN AND PRODUCE A DIRECT-DIGITAL WAVEFORM GENERATOR THAT SUPPORTS COMPLEX MODULATION OVER A WIDER BANDWIDTH AND WITH BETTER SPECTRAL PURITY THAN IS NOW ATTAINABLE. THE RESULT WILL EXPLOIT ADVANCED SEMICONDUCTOR TECHNOLOGY, SOUND DESIGN PRINCIPLES, AND AGGRESSIVE WAVEFORM CONSTRUCTION ALGORITHMS. DURING PHASE I, SCITEQ WILL CHARACTERIZE TODAY'S TECHNOLOGY AT THE SEMICONDUCTOR, DEVICE, AND SUBSYSTEM DESIGN LEVELS, AND WILL EVALUATE SOFTWARE CONTROL/INTERFACE METHODOLOGIES. SCITEQ WILL THEN SELECT AMONG THE OPTIONS VALIDATED AND WRITE A DETAILED PLAN FOR PHASE II THAT INCLUDES A SOURCE CONTROL DRAWING AND STATEMENT OF WORK. PHASE II WILL PRODUCE A HARDWARE IMPLEMENTATION OF THE DESIGN. PHASE III WILL COMPLETE PRODUCTION ENGINEERING AND MILITARIZATION OF THE DESIGN, PLUS NON-GOVERNMENT COMMERCIALIZATION, AS APPROPRIATE.

HITTITE MICROWAVE CORP
21 CABOT RD
WOBURN, MA 01801
Program Manager: BARAK MAOZ
Contract #:
Title: GPS FREQUENCY TRANSLATOR INTEGRATED CIRCUITS
Topic #: A90-329 Office: HDL ID #: 42106

FOR MONITORING TRAJECTORY OF MISSILES AND PROJECTILE, THE POSITIONING DATA ACCESSIBLE FROM THE GPS SATELLITES MAY BE USED EFFECTIVELY ANYWHERE ON EARTH. FOR THIS APPLICATION, A FREQUENCY TRANSLATOR IS REQUIRED ON-BOARD TO RELAY THE SATELLITE DATA ON ANOTHER CARRIER. DESIGN APPROACHES TO MINIATURIZE THE TRANSLATOR, BASED ON EFFECTIVE UTILIZATION OF THE MMIC TECHNOLOGY, FOR APPLICATIONS ON SMALL PLATFORMS WILL BE INVESTIGATED. TRADE-OFF STUDIES OF AVAILABLE DEVICE TECHNOLOGIES, MMIC PROCESSING CAPABILITIES, RF PERFORMANCE, AND COST-EFFECTIVENESS, WILL LEAD TO A BASE-LINE DESIGN OF THE TRANSLATOR PACKAGE. BOTH SILICON AND GALLIUM-ARSENIDE DEVICE TECHNOLOGIES AND HYBRID MIC AND COMPLETE MMIC APPROACHES WILL BE EVALUATED. THE OPTIMUM APPROACH WILL EMERGE AS A COMBINATION OF SEVERAL DEVICES AND INTEGRATION TECHNIQUES. HITTITE MICROWAVE CORPORATION HAS A UNIQUE EXPERIENCE BASE FOR REALISTIC ASSESSMENT OF MMIC CAPABILITIES BASED ON GaAs MESFET, GaAs HBT AND Si BJT DEVICES, AND A LARGE-SCALE INTEGRATION OF RF CIRCUITS INTO A SINGLE CHIP AND/OR MODULE.

INTERNATIONAL TECHNOLOGY SERVICES INC
PO BOX 67
DeVAULT, PA 19432
Program Manager: F A SELIM
Contract #:
Title: ZnO SINGLE BARRIER VARISTOR FOR LOGIC CIRCUITS PROTECTION
Topic #: A90-330 Office: HDL ID #: 42107

A PROCESS IS DESCRIBED FOR FABRICATING ZnO VARISTORS WITH A NON-LINEARITY COEFFICIENT FROM 25 TO 50 AND A BREAKDOWN VOLTAGE IN THE RANGE OF 2 TO 5 VOLTS TO PROVIDE TRANSIENT VOLTAGE PROTECTION FOR LOGIC CIRCUITS. THE PROPOSED PROCEDURE CONSISTS OF MAKING A SINGLE BARRIER JUNCTION BY ALLOYING OR SPUTTERING A THIN LAYER OF THE ADDITIVE OXIDES OF Bi, Sb, Co, Cr, ETC. ON ZnO POLYCRYSTALLINE SUBSTRATE. THE POLYCRYSTALLINE BODY IS USED FOR ENERGY ABSORPTION AND THE JUNCTION PROVIDES THE REQUIRED NON-LINEAR CURRENT-VOLTAGE CHARACTERISTICS. THE STRUCTURE CAN ALSO BE ACCOMPLISHED BY ION- IMPLANTATION OR BY USING METALLIC CONTACTS CONTAINING OXIDES OF Bi AND Pb WHICH ALSO SERVE AS A DIFFUSION SOURCE FOR GRAIN AND/OR GRAIN BOUNDARY DOPING. THIS METHOD PROVIDES AN IC COMPATIBLE PROCESS AND A LOW-COST PROCESS. FABRICATION AND CHARACTERIZATION OF THESE VARISTORS AND THE ROLE OF ANNEALING TEMPERATURE AND AMBIENT AND ITS EFFECT ON THE I-V CHARACTERISTICS WILL BE EXAMINED IN DETAIL.

SENSIS CORP
5793 WIDEWATERS PKWY
DeWITT, NY 13214
Program Manager: DANIEL P FITCH
Contract #:
Title: OVER-THE-GROUND DISTANCE MEASUREMENT DEVICE
Topic #: A90-331 Office: HDL ID #: 42108

A DEVICE THAT MEASURES DISTANCE TRAVELED BY A VEHICLE OR MAN WITHOUT REQUIRING ATTACHMENT TO A WHEEL IS SOUGHT. SUCH A DEVICE IS DESIRED IN ORDER THAT A UNIVERSALLY APPLICABLE NAVIGATOR BE AVAILABLE FOR MONITORING THE BATTLEFIELD MOVEMENTS OF SOLDIERS AND VEHICLES. WE PROPOSE TO EVALUATE A NUMBER OF TECHNOLOGIES THAT ARE POTENTIALLY SUITABLE FOR THIS APPLICATION INCLUDING RADAR, ACOUSTIC/ULTRASONIC, AND IR TECHNOLOGIES. THE STUDY WILL COMPARE DESIGNS BASED ON BOTH DOPPLER AND TIME DOMAIN CORRELATION TECHNIQUES. EVALUATIONS WILL BE CONDUCTED BY DEVELOPING VARIOUS CONCEPTS TO A POINT AT WHICH ACCURACY, SIZE, WEIGHT, COST, AND DURABILITY CAN BE ASSESSED AND A COMPARISON OF EACH MADE. WHILE SEVERAL CURRENTLY AVAILABLE DEVICES CAN FULFILL THE STATED NEED, MOST ARE UNSUITABLE DUE TO COST OR ACCURACY, I.C. ACCELEROMETERS AND PEDOMETERS. WE ANTICIPATED THAT A NOVEL ACOUSTICAL TECHNIQUE BASED ON CORRELATION, SIMILAR TO THAT USED FOR NAVIGATION ON THE TRIDENT SUBMARINE, WILL BE BEST SUITED TO REPLACE THE PRESENT ODOMETER DRIVEN ENCODER. THIS TECHNIQUE, BECAUSE IT STARES DIRECTLY AT THE GROUND, REQUIRES VERY LOW POWER AND CONSEQUENTLY SUFFERS LITTLE MUTUAL INTERFERENCE WITH OTHER SENSORS IN THE SAME VICINITY.

NORTH STAR RESEARCH CORP
5555 ZUNI SE - STE 345
ALBUQUERQUE, NM 87108
Program Manager: DR RICHARD J ADLER
Contract #:
Title: A NESTED HIGH VOLTAGE GENERATOR APPROACH TO HPM PULSE POWER
Topic #: A90-332 Office: HDL ID #: 42109

IN ORDER TO OVERCOME THE LIMITATIONS OF PRESENT HIGH POWER MICROWAVE SOURCES, A NEW TYPE OF PULSE POWER SYSTEM IS PROPOSED AS THE MOTIVE POWER FOR HIGH POWER MICROWAVE GENERATORS. BY BUILDING UP A DC HIGH POWER SOURCE FROM A NUMBER OF DC HIGH VOLTAGE MODULES WHICH ARE NESTED INSIDE ONE ANOTHER, VERY HIGH VOLTAGES CAN BE PRODUCED IN SMALL PACKAGES. NO TWO CONDUCTORS NEED TO BE INSULATED FOR VOLTAGES EXCEEDING 50-100 kV. PULSE DISCHARGE CAPACITORS OR PULSE FORMING NETWORKS CAN BE PLACED INSIDE EACH CELL IN ORDER TO PRODUCE FLAT- TOPPED PULSES. THIS CONFIGURATION CAN BE USED TO EITHER DRIVE A SEPARATE ELECTRON BEAM GENERATOR, OR THE ELECTRON BEAM CAN BE PRODUCED INSIDE THE GENERATOR ITSELF. THE NESTED GENERATOR CAN ALSO BE CONFIGURED FOR EFFICIENT ENERGY RECOVERY EVEN WHEN THE BEAM ELECTRONS HAVE LOST DIFFERING AMOUNTS OF ENERGY. IN THIS PAPER, A DETAILED INVESTIGATION OF THE POSSIBLE CONFIGURATIONS WILL BE PERFORMED. EMPHASIS WILL BE PLACED ON DEVELOPING THE CONVENTIONAL PULSE POWER GENERATOR CONFIGURATION, INCLUDING ASSOCIATED SWITCHING AND PULSE FORMING ISSUES. EXPERIMENTS WILL ALSO BE PERFORMED ON THE EXISTING NESTED HIGH VOLTAGE GENERATOR AT NSRC IN ORDER TO DETERMINE THE ACHIEVABLE VOLTAGE GRADIENT ON THE INSULATION MATERIAL USED IN THE EXPERIMENT. ENERGY RECOVERY, AND GATED, PULSED ELECTRON BEAM GENERATION WILL ALSO BE STUDIED.

INTER-SCIENCE INC
105 JORDAN RD
TROY, NY 12180
Program Manager: DR EDUARDO SARAVIA
Contract #:
Title: HIGH SENSITIVITY WIDEBAND ANALOG FIBER OPTIC LINK
Topic #: A90-333 Office: HDL ID #: 42110

THE DEVELOPMENT OF AN ANALOG OPTICAL DATA LINK CAPABLE OF TRANSMITTING RF SIGNALS OF A MINIATURE SENSOR TO REMOTE DETECTION AND RECORDING SYSTEMS IS PROPOSED. THE SYSTEM IS BASED ON A SPECIFIC MINIATURE DIODE-LASER, A PIGTAIL SINGLE-MODE FILTER OPTIC CABLE AND A PHOTODIODE/AMPLIFIER RECEIVER. THE FREQUENCY RESPONSE, LINEARITY AND SENSITIVITY OF SUCH A LASER CONSTITUTES A VERY ATTRACTIVE CANDIDATE TO BE USED IN DIRECT MODULATION MODE BY RF SMALL-SIGNALS. SINCE THE MAXIMUM FREQUENCY OF THE MODULATING SIGNAL IS MODERATELY HIGH, AND SPECTRAL CHIRPING EFFECTS ARE NOT SIGNIFICANT FOR RELATIVELY SHORT LINK DISTANCES, WE EXPECT THAT NEGATIVE SIDE EFFECTS DUE TO DIRECT MODULATION OF THE LASER DIODE WILL NOT INFLUENCE THE PERFORMANCE OF THE SYSTEM. THE MAIN ADVANTAGE OF THIS CONCEPT IS ITS SIMPLICITY AND HIGH EXPECTED PERFORMANCE TO COMPLY WITH THE REQUIRED SENSITIVITY AND FREQUENCY RESPONSE FOR THE APPLICATION. A PROTOTYPE UNIT WILL BE DEVELOPED AND FULLY TESTED UNDER THE PHASE I EFFORT TO DEMONSTRATE THE FUNCTIONAL CAPABILITIES OF THE PROPOSED CONCEPT.

STRUCTURED SYSTEMS & SOFTWARE INC (3S)
23141 PLAZA POINTE DR
LAGUNA HILLS, CA 92653
Program Manager: JAMES E DANAHER
Contract #:
Title: FREQUENCY TRANSLATOR GPS SIGNAL RECEIVER
Topic #: A90-335 Office: HDL ID #: 42111

THE USE OF TRANSLATED OR TRANSDIGITIZED GLOBAL POSITIONING SYSTEM (GPS) SIGNALS IS A PROMISING METHOD FOR DETERMINING THE PRECISE FLIGHT PATH OF AN ARTILLERY SPOTTER ROUND. THE PRIMARY ELEMENTS OF THE GPS ARTILLERY SPOTTER ROUND SYSTEM ARE A GPS TRANSLATOR OR TRANSDIGITIZER IN THE PROJECTILE FUSE AND A TRANSLATED/TRANSDIGITIZED GPS RECEIVER LOCATED AT THE FIRING PLATFORM. THIS SYSTEM WILL PROVIDE EACH FIRING PLATFORM WITH AN AUTONOMOUS MEANS OF PERFORMING REGISTRATION AND TRANSFER WITHOUT THE AID OF EITHER A FORWARD

OBSERVER OR RADAR. ANOTHER IMPORTANT APPLICATION OF TRANSLATED/ TRANSDIGITIZED GPS IS IN THE TRACKING OF WEATHER RADIOSONDES. A TRANSDIGITIZED GPS RECEIVER WOULD USE THE TRANSDIGITIZED GPS SIGNAL TO COMPUTE THE POSITION OF THE RADIOSONDE. THE SPECIFIC TECHNICAL PROBLEM TO BE ADDRESSED DURING THE PROPOSED PHASE I CONTRACT IS TO DESIGN A TRANSLATED/TRANSDIGITZED GPS RECEIVER TO HANDLE BOTH THE ARTILLERY SPOTTER ROUND AND THE WEATHER RADIOSONDE APPLICATIONS. TO THE MAXIMUM EXTENT POSSIBLE, THIS TRANSLATED/TRANSDIGITIZED GPS RECEIVER WILL BE BASED ON EXISTING, FIELD-QUALIFIED MILITARY HARDWARE AND SOFTWARE.

INTEGRATED SCIENCES
6635 S NEW HAVEN AVE
TULSA, OK 74136
Program Manager: CLINTON DUTCHER
Contract #:
Title: METALLIC QUANTUM TUNNELLING VARISTOR DEVICES
Topic #: A90-336 Office: HDL ID #: 42112

FOR FAST RISE TIME PULSES AND HIGH POWER MICROWAVE APPLICATIONS, A NEW CLASS OF VARISTOR DEVICES IS NEEDED THAT SURPASSES THE PERFORMANCE OF PRESENT DEVICES. CURRENTLY AVAILABLE VARISTOR MATERIALS DEPEND ON SEMICONDUCTOR JUNCTIONS, AVALANCHE MECHANISMS, OR ZENER ACTION, OR A COMBINATION OF THESE EFFECTS. AN ALTERNATIVE THAT OFFERS SIGNIFICANT ADVANTAGES IN TERMS OF RESPONSE CHARACTERISTICS, RELIABILITY, AND TEMPERATURE STABILITY IS TO USE METALLIC QUANTUM TUNNELLING TO PRODUCE THE DESIRED NONLINEAR CHARACTERISTICS. ALTHOUGH THERE ARE MATERIALS THAT ARE PURPORTEDLY OF THE METALLIC TUNNELLING VARIETY, WE BELIEVE THE TUNNELLING REGIME HAS NOT BEEN ACHIEVED NOR HAS THERE BEEN AN APPROPRIATE EMPIRICAL QUANTUM TUNNELLING SIGNATURE USED IN EVALUATING THESE MATERIALS. THE OBJECTIVES OF THIS PROJECT ARE TO: DEVELOP A CORRECT EMPIRICAL SIGNATURE INDICATING WHETHER OR NOT A VARISTOR MATERIAL IS OPERATING IN THE METALLIC TUNNELLING REGIME; DETERMINE MATERIAL PARAMETERS TO ASSURE THE TUNNELLING REGIME IS ACHIEVED; FABRICATE METALLIC TUNNELLING VARISTORS APPROPRIATE FOR PROTECTION OF HF, VHF, AND UHF COMMUNICATIONS EQUIPMENT FROM UPSET OR FAILURE CAUSED BY "FRONT- DOOR" EMP INTRUSION; TEST THE DEVICES UNDER LABORATORY CONDITIONS.

EASTERN LABS INC
3640 MAIN ST
SPRINGFIELD, MA 01107
Program Manager: DR FRANTISEK MIKES
Contract #:
Title: FLUOBORIC ACID ELECTROLYTE ANALYSIS BY ION CHROMATOGRAPHY
Topic #: A90-337 Office: HDL ID #: 42113

FLUOBORIC ACID SOLUTION, USED AS THE ELECTROLYTE IN SOME LIQUID RESERVE BATTERIES, REQUIRES CHEMICAL ANALYSIS OF THIS ELECTROLYTE AND FOUR (4) ACCOMPANYING PARAMETERS (BORATE, SULFATE, BROMIDE, LEAD). A DUAL ION CHROMATOGRAPHIC SYSTEM (IC, HARDWARE), CONTROLLED BY A PC WORKSTATION (SOFTWARE) WILL BE ASSEMBLED FROM VARIOUS SOURCES. SUITEABLE CHROMATOGRAPHIC METHODS WILL BE DEVELOPED OR ADAPTED, AND OPTIMIZED FOR THE ANALYSIS OF THE COMPLEX ELECTROLYTE MATRIX, CONSISTING OF FOUR MONOVALENT ANIONS: FLUOBORATE ($BF(4)^-$), BORATE, SULFATE, BROMIDE, AND DIVALENT LEAD CATION. ONE IC UNIT WILL ANALYZE THE ANIONS (ALMOST SIMULTANEOUSLY) USING AN AUTOMATIC COLUMN-SWITCHING VALVE TO ONE ANION EXCLUSION (1ST) AND ONE ANION EXCHANGE (2ND) COLUMN. THE ELUANTS EMPLOYED WOULD INCLUDE OCTANESULFONIC ACID FOR ANION EXCLUSION AND SODIUM OCTANESULFONATE FOR ANION EXCHANGE. THE LEAD DETERMINATION WOULD BE ACHIEVED, ALSO SIMULTANEOUSLY, ON A SECOND IC UNIT (AS AN ION-PAIR) USING OCTANESULFONATE IN THE MOBILE PHASE. THE COLUMN WILL CONTAIN SPHERICALLY

SHAPED PARTICLES WITH TOTALLY ENDCAPPED SILANOL GROUPS. THE USE OF AN AUTOSAMPLER IN EACH IC UNIT WILL REDUCE THE TOTAL LABOR TIME FOR THE ANALYSIS OF A SINGLE SHIPPING CONTAINER OF ELECTROLYTE (IN DUPLICATE) FROM THE NOW EXISTING 24 MAN-HOURS AT HDL TO ABOUT 1 MAN-HOUR.

TIGER LILY LTD
JOURNEY'S END
CROTON-ON-HUDSON, NY 10520
Program Manager: ROBERT J RICHTER
Contract #:
Title: WEATHER SEALED RF SHIELDED EXTERNAL ENTRY VAULT
Topic #: A90-338 Office: HDL ID #: 42272

A REVIEW OF COMMERCIAL RF SHIELDING CLASS 3, 3R, 4, 4X WILL BE PERFORMED. IN ADDITION A NEW DESIGN WILL BE INVESTIGATED, WITH THE OBJECT TO PRODUCE A COST EFFECTIVE UNIT THAT MEETS THE PROGRAM CRITERIA. ADDITIONALLY, NEW MATERIALS AND METHODS WILL BE INVESTIGATED WITH THE POSSIBILITY OF DEVELOPING A RETROFIT SYSTEM.

APPLIED TECHNOLOGY ASSOCS INC
PO BOX 9154
ALBUQUERQUE, NM 87119
Program Manager: DARREN LAUGHLIN
Contract #:
Title: LOW COST ANGULAR RATE SENSOR
Topic #: A90-339 Office: HDL ID #: 42115

APPLIED TECHNOLOGY ASSOCIATES, INC., (ATA) DESIGNED, FABRICATED, AND PERFORMED AN INITIAL TEST OF A DEVICE WHICH REPRESENTS A NEW CONCEPT FOR AN INERTIAL, ANGULAR RATE SENSOR. THE SENSOR UTILIZES A MERCURY PROOF MASS WHOSE ANGULAR RATE IS DETERMINED FROM THE VOLTAGE GENERATED AS THE MERCURY MOVES THROUGH A MAGNETIC FIELD. THE DEVICE HAS NO PRECISION PARTS NOR MOVING PARTS EXCEPT LIQUID MERCURY. THIS SENSOR HAS THE POTENTIAL TO FULFILL THE ARMY'S NEED FOR A RUGGED, LOW-COST COMPONENT IN A BATTLEFIELD NAVIGATION SYSTEM. THIS PHASE I SBIR PROGRAM WILL MEASURE THE IMPORTANT PARAMETERS WHICH CHARACTERIZE THE PERFORMANCE OF A NAVIGATION GRADE ANGULAR SENSOR, INCLUDING SCALE FACTOR, LINEARITY, NOISE, RESOLUTION, DRIFT RATE, AND TEMPERATURE SENSITIVITY. BASED ON THE PHASE I TEST RESULTS, A SENSOR OPTIMIZED FOR THE ARMY'S REQUIREMENTS WILL BE DESIGNED FOR FABRICATION AND TESTING IN PHASE II. THE UNIT COST FOR PRODUCTION IN PHASE III WILL BE ESTIMATED. THE PERFORMANCE AND COST OF THE SENSOR WILL BE COMPARED WITH OTHER CANDIDATES SUCH AS THE HUMPHREY AND HONDA SENSORS. THIS PROGRAM WILL CAPITALIZE ON ATA STAFF'S KNOWLEDGE AND EXPERIENCE GAINED IN CARRYING AN ANGULAR VIBRATION SENSOR OF SIMILAR CONSTRUCTION FROM CONCEPT TO COMMERCIAL PRODUCTION.

SABBAGH ASSOCS INC
4639 MORNINGSIDE DR
BLOOMINGTON, IN 47401
Program Manager: L DAVID SABBAGH
Contract #:
Title: COMPUTATION OF NONLINEAR ELECTROMAGNETIC EFFECTS BY MEANS OF FREQUENCY-DOMAIN VOLUME-INTEGRAL EQUATIONS
Topic #: A90-340 Office: HDL ID #: 42116

THERE IS A NEED TO DEVELOP SPECIAL PURPOSE ALGORITHMS FOR SOLVING ELECTROMAGNETIC

COUPLING AND SCATTERING PROBLEMS, THAT WILL TAKE ADVANTAGE OF RECENT ADVANCES IN COMPUTER TECHNOLOGY. TO THAT END WE PROPOSE A NOVEL ALGORITHM THAT IS BASED ON SOLVING NONLINEAR VOLUME-INTEGRAL EQUATIONS IN THE FREQUENCY-DOMAIN. THIS METHOD APPEARS TO OFFER SEVERAL ADVANTAGES OVER OTHER TECHNIQUES: (a) IT WILL ALLOW THE SOLUTION OF NONLINEAR COUPLING PROBLEMS IN A RATHER DIRECT MANNER, (b) IT WILL TAKE ADVANTAGES OF THE SPECIAL STRUCTURE OF THE MATRIX-OPERATOR, WHICH IS FOUR-DIMENSIONAL TOEPLITZ-HANKEL, BY USING CONJUGATE-GRADIENTS, FAST FOURIER TRANSFORMS, AND CONVOLUTIONS, (c) IT APPEARS TO BE AMENABLE TO SEVERAL NEW COMPUTER ARCHITECTURES AND HARDWARE, SUCH AS VECTOR-CONCURRENT PROCESSORS, DIGITAL SIGNAL PROCESSING (DSP) CHIPS THAT PERFORM FAST CONVOLUTIONS, TRANSPUTER, AND OTHER NETWORKING POSSIBILITIES, AND (d) IT WILL EXTEND ELECTROMAGNETIC CODES AND MODELS ALREADY BEING DEVELOPED FOR COMMERCIAL PURPOSES BY SABBAGH ASSOCIATES. THE RANGE OF PROBLEMS THAT CAN BE EFFICIENTLY SOLVED BY THE ALGORITHS, AND THE ASSOCIATED HARDWARE, IS EXPECTED TO BE QUITE LARGE, EXTENDING FROM LINEAR EMP *COUPLING TO CABLES IN THE PRESENCE OF A CONDUCTIVE DIELECTRIC HALF-SPACE (GROUND).* TO NONLINEAR EFFECTS PRODUCED BY ELECTROMAGNETIC ENVIRONMENTS. AS AN EXAMPLE OF THE LATTER, WE WOULD EXPECT TO BE ABLE TO MODEL, IN A VERY STRAIGHTFORWARD MANNER, THE PROBLEM OF AIR BREAKDOWN IN APERTURES THAT ARE ILLUMINATED BY AN ELECTROMAGNETIC PULSE.

APPLIED POLYMER SYSTEMS INC
PO BOX 4040
COLLEGE PARK, NY 11356
Program Manager: DR NUKA V REDDY
Contract #:
Title: COATINGS FOR SELECTIVE MICROWAVE ABSORPTION
Topic #: A90-341 Office: HDL ID #: 42117

THIS PROPOSAL DESCRIBES RESEARCH TO DEVELOP MODELS AND METHODOLOGY PRODUCTS FOR SELECTIVE MICROWAVE RADIATION ABSORPTION. OUR MATERIALS ARE COATINGS. WE PROPOSE TO INCORPORATE FERROMAGNETIC AND FERRITE MATERIALS IN ORGANIC POLYMERS AND DEVELOPE EASILY APPLICABLE COATINGS ON VARIOUS SUBSTRATES LARGE AND SMALL. THESE COATINGS SHOULD BE HAVING A STRONG IN-BAND TRANSMISSION AND STRONG OUT OF BAND ATTENUATION. WE WILL ATTEMPT TO DEVELOP SEVERAL COMBINATIONS SO THAT THEY FORM WINDOWS FOR VARIOUS REGIONS OF MW FREQUENCY. A SAMPLE WILL BE MADE TO DETERMINE THE FEASIBILITY OF OUR APPROACH AND TO FIND THEIR COST EFFECTIVENESS. BASED UPON THESE RESULTS, PHASE II WORK OBJECTIVES WILL BE PROPOSED.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482
ALBUQUERQUE, NM 87198
Program Manager: DR DAVID E MEREWETHER
Contract #:
Title: ELECTROMAGNETIC PULSE (EMP) COUPLING TO CABLES
Topic #: A90-342 Office: HDL ID #: 42118

A COMBINED ANALYSIS AND EXPERIMENT PROGRAM IS PROPOSED THAT WILL IMPROVE THE ACCURACY OF THE REVISED TRANSMISSION LINE MODEL FOR A CABLE NEAR OR ON THE SURFACE OF A LOSSY EARTH. ANALYSIS WILL BE USED TO DETERMINE THE EFFECTS OF FREQUENCY DEPENDANT EARTH PARAMETERS ON THE MODELED IMPEDANCE. EXPERIMENTS WILL BE CONDUCTED UNDER CONTROLLED CONDITIONS TO VERIFY THE PREDICTIONS OF THE REVISED TRANSMISSION LINE MODEL. MEASUREMENTS WILL BE MADE OF BOTH THE CABLE IMPEDANCE PARAMETERS AND THE RESPONSE TO AN EM ENVIRONMENT.

TETRA CORP
4905 HAWKINS NE
ALBUQUERQUE, NM 87109
Program Manager: A E RODRIGUEZ
Contract #:
Title: A QUASI-EQUILIBRIUM KINETIC MODEL OF HF AIR BREAKDOWN
Topic #: A90-343 Office: HDL ID #: 42119

WE PROPOSE TO BUILD A QUASI-EQUILIBRIUM KINETIC MODEL OF HIGH FREQUENCY (HF) AIR BREAKDOWN BASED ON THE SPARK BREAKDOWN MODEL DEVELOPED AT TETRA CORPORATION FOR AIR AND SULFUR HEXAFLOURIDE (SF[6]). AN UNDERSTANDING OF THE TIME-DEPENDENT BREAKDOWN PROCESS IS THE MOST CRITICAL PART OF A COMPLETE PHENOMENOLOGICAL MODEL OF ELECTRO MAGNETIC PULSE (EMP) ARCING IN APERTURES. PHASE I WILL DETERMINE STREAMER BEHAVIOR AND THE ADEQUACY OF THE KINETIC METHODOLOGY IN ONE DIMENSIONAL AND ZERO DIMENSIONAL MODELS. MULTIDIMENSIONAL MODELS WILL BE BUILD AND MODEL VERIFICATION EXPERIMENTS WILL BE PERFORMED IN PHASE II.

ENSCO INC
5400 PORT ROYAL RD
SPRINGFIELD, VA 22151
Program Manager: BOB GRAY
Contract #:
Title: FAST-RISETIME DIRECT CONNECT AND MAGNETICALLY COUPLED CABLE DRIVER SYSTEM
Topic #: A90-344 Office: HDL ID #: 42120

THE ELECTROMAGNETIC PULSE TESTING OF ARMY SYSTEMS DEPENDS HEAVILY ON AN ABILITY TO EXCITE LARGE, FAST RISETIME CURRENTS ON SYSTEM CABLES. THE PROPOSED RESEARCH WILL PROVIDE A SIGNIFICANT ADVANCEMENT IN CABLE EXCITATION VIA DIRECT CONNECT AND MAGNETICALLY COUPLED METHODS. THE PROPOSED DESIGN IS MODULAR, ALLOWING EASY MODIFICATION OF SOURCE WAVEFORM AND ADAPTION TO A WIDE SPECTRUM OF APPLICATIONS. THE PHASE I ACTIVITIES WILL INCLUDE A STUDY OF NEWLY DEVELOPED FERRITE CORE MATERIALS, DEVELOPMENT OF A SCALE MODEL PROTOTYPE OF THE CABLE DRIVE SYSTEM AND A DESIGN OF THE FULL SCALE SYSTEM.

FLAM & RUSSELL INC
PO BOX 999 - 506 PRUDENTIAL RD
HORSHAM, PA 19044
Program Manager: JEFFREY F BULL
Contract #:
Title: WIDEBAND ELECTRIC MAGNETIC FIELD SENSORS
Topic #: A90-345 Office: HDL ID #: 42121

THE ABILITY TO MEASURE THE STRENGTH OF ELECTROMAGNETIC FIELDS IS OF EXTREME IMPORTANCE IN MANY AREAS. TODAY'S FREQUENCY SPECTRUM IS CROWDED. ELECTROMAGNETIC FIELDS ARE EVERYWHERE AND AT ALL FREQUENCIES. OF PARTICULAR IMPORTANCE IS THE MEASUREMENT OF FIELDS AT AN AIR/METAL BOUNDARY BECAUSE MUCH EQUIPMENT IS HOUSE IN METAL ENCLOSURES. SINCE BOTH ELECTRIC (E) AND MAGNETIC (H) FIELDS CAN EXIST AT THIS BOUNDARY, BOTH MUST BE MEASURED. MANY APPLICATIONS ALSO REQUIRE THAT THEY ARE MEASURED SIMULTANEOUSLY. DEVICES FOR MEASURING THESE FIELDS ARE E AND H FIELD PROBES. THEY ARE, IN EFFECT, ELECTRICALLY SMALL ANTENNAS. FLAM & RUSSELL, INC. (FR) HAS SPECIFIC EXPERTISE IN THE DESIGN AND CONSTRUCTION OF BROADBAND, ELECTRICALLY SMALL ANTENNAS. IN THIS PHASE I EFFORT WE PROPOSE TO USE OUR WELL DEVELOPED, AND WELL TESTED, THEORY OF ELECTRICALLY SMALL ANTENNAS TO PROVIDE PROTOTYPE E AND H FIELD PROBES. OUR GOAL IS TO MAKE THEM AS PHYSICALLY SMALL AS POSSIBLE. ADDITIONALLY, THEY WILL BE DESIGNED TO PROVIDE A VOLTAGE THAT IS PROPORTIONAL TO THE FIELD

AND CONSTANT OVER A LARGE FREQUENCY RANGE. FURTHERMORE, WE WILL PROVIDE A PROBE THAT SIMULTANEOUSLY AND INDEPENDENTLY MEASURES THE THREE ORTHOGONAL FIELD COMPONENTS THAT EXIST AT AN AIR/METAL BOUNDARY.

SABBAGH ASSOCS INC
4639 MORNINGSIDE DR
BLOOMINGTON, IN 47401
Program Manager: SINA BARKESHLI
Contract #:
Title: EFFICIENT ASYMPTOTIC CLOSED FORM APPROXIMATIONS OF DYADIC GREEN'S FUNCTIONS FOR ANISOTROPIC SUBSTRATES
Topic #: A90-346 Office: HDL ID #: 42122

NEW TYPES OF ANISOTROPIC MATERAILS, SUCH AS COMPOSITES, CERAMICS, AND HONEYCOMB STRUCTURE, ARE FINDING INCREASINGLY IMPORTANT APPLICATIONS IN HIGH-FREQUENCY ELECTROMAGNETICS. THESE APPLICATIONS RANGE FROM MICROWAVE AND MILLIMETER-WAVE INTEGRATED CIRCUITS AND OPTICAL DEVICES TO ANTENNA RADOMES AND RADAR ABSORBER MATERIALS. WHILE THE BASIC THEORY OF THE INTERACTION WITH ANISOTROPIC MATERIALS OF ELECTROMAGNETIC PLANE AND GUIDED WAVES IS WELL ESTABLISHED, LITTLE HAS BEEN DONE IN STUDYING THE INTERACTION OF ELECTROMAGNETIC CURRENT SOURCES WITH ANISOTROPIC MATERIALS. THE IMPORTANCE OF THIS KNOWLEDGE IS DUE TO A SERIOUS NEED FOR EFFICIENT DESIGN PROCEDURES FOR HIGH PERFORMANCE MONOLITHIC INTEGRATED CIRCUITS, THAT OPERATE IN THE HIGH FREQUENCY REGIME (MILLIMETER TO OPTICAL WAVELENGTH). THIS KNOWLEDGE IS ALSO CRUCIAL TO NON-DESTRUCTIVE EVALUATION (NDE) OF A VARIETY OF THE INCREASINGLY USED ADVANCED COMPOSITE MATERIALS. WE HOPE TO PROVIDE THIS KNOWLEDGE THROUGH AN ACCURATE AND EFFICIENT CLOSED FORM SOLUTION OF THE DYADIC GREEN'S FUNCTIONS FOR ANISOTROPIC SUBSTRATES, AND TO INCORPORATE THIS INTO A COMPUTER CODE THAT CAN BE USED AS AN EFFICIENT DESIGN TOOL. THIS IS THE KEY, THEREFORE, TO THE RELIABLE, OPTIMUM, AND EFFICIENT PROCEDURE FOR ANALYZING HIGH-PERFORMANCE MONOLITHIC MILLIMETER-WAVE AND OPTICAL INTEGRATED CIRCUITS, AS WELL AS NON-DESTRUCTIVE EVALUATION (NDE) OF WIDELY USED ADVANCED COMPOSITES.

OMNITEK INC
PO BOX 9265 - ROSSLYN STA
ARLINGTON, VA 22209
Program Manager: ROBERT J EIN
Contract #:
Title: COMPOSITE MATERIALS FOR COMMUNICATION SHELTERS
Topic #: A90-347 Office: HDL ID #: 42123

A MODIFIED COMMUNICATIONS SHELTER IS PROPOSED THAT WILL BE DIFFICULT TO DETECT BY STANDARD MEANS. IT WILL HAVE LOW RADAR CROSS SECTION (RCS), CONTROLLED INFRARED (IR) SIGNATURE, LOW VISIBILITY AND WILL MEET APPLICATIONS FOR ELECTROMAGNETIC SHEILDING. THE SHELTER WILL SATIFY STANDARD ENVIRONMENTAL SPECIFICATIONS FOR WEATHER WORTHINESS, ETC., BUT ALSO WILL SURVIVE CERTAIN WEAPONS EFFECTS SUCH AS ELECTRO- MAGNETIC PULSE (EMP), NUCLEAR BLAST OVERPRESSURE AND SMALL ARMS PROJECTILES. THIS RESEARCH AND DEVELOPMENT WILL ADDRESS THE ISSUE OF OPTIMIZING AS MANY OF THESE DESIRABLE PROPERTIES AS POSSIBLE SIMULTANEOUSLY. FOR EXAMPLE, LOW RCS REQUIRES EXTENSIVE USE OF LOW DIELECTRIC CONSTANT MATERIALS; MATERIALS WITH LOW DIELECTRIC CONTANTS ARE LIGHTWEIGHT BUT ARE ORDINARILY STRUCTURALLY UNSOUND (E.G. FOAM). THIS RESEARCH AND DEVELOPMENT EFFORT WILL OPTIMIZE BOTH STRUCTURAL AND LOW RCS REQUIREMENTS AT THE SAME TIME. SOME OTHER PROPERTIES THAT REQUIRE TRADEOFF OPTIMIZATION INCLUDE: LOW IR EMISSIVITY AND MINIMUM RCS; MINIMUM WEIGHT AND MAXIMUM PROJECTILE PENETRATION RESISTANCE; AND, MINIMUM RCS FROM SHAPING AND MAXIUM USEABLE

INTERIOR SPACE.

HORINE ENGINEERS INC
PO BOX 2027
LOS GATOS, CA 95031
Program Manager: CARLTON L HORINE
Contract #:
Title: REFORMING RADIO FREQUENCY DOOR GASKETS
Topic #: A90-348 Office: HDL ID #: 42124

THE ARMY IS USING WIRE MESH COVERED ELASTOMERIC CORE GASKET FOR SHIELDING DOORS SUBJECTED TO EM RADIATION. ALTHOUGH SHIELDING EFFECTIVENESS MEETS SPECIFICATIONS WHEN THE GASKETS ARE NEW, THEY LOSE THEIR EFFECTIVENESS IN A FEW MONTHS. THIS LOSS IS DUE TO "GASKET SET" OF THE ELASTOMERIC CORE. IT IS PROPOSED TO DEVELOP A NEW GASKET WITH A PRESSURIZED HOLLOW CORE THAT SERVES TO COMPENSATE FOR THE GASKET SET. IN THIS PHASE I WORK IT IS PROPOSED TO CHARACTERIZE THE PROPERTIES OF THE CURRENT GASKET, DEVISE A DESIGN FOR A HOLLOW CORE GASKET USING COMMERCIALLY AVAILABLE MATERIALS. A CONCEPTUAL DESIGN WILL BE PREPARED FOR A PRACTICAL, MANUALLY POWERED PRESSURIZING SYSTEM. ACCELERATED AGING TESTS WILL VERIFY THE PROPERTIES OF THE GASKET ELASTOMERIC MATERIALS. FINALLY, A PROTOTYPE GASKET WILL BE DESIGNED, FABRICATED AND TESTED IN A SIMULATION OF USE IN A RF SHIELDED DOOR. IT WILL ALSO BE SUBJECTED TO AN ACCELERATED AGING TEST TO VERIFY THAT THE DESIGN IS FEASIBLE. CONCEPTUAL DESIGNS OF A FULL SCALE GASKET AND PRESSURIZING SYSTEM WILL ALSO BE PREPARED.

UCE INC
35 ROCKLAND RD
NORWALK, CT 06854
Program Manager: M LEIBOWITZ
Contract #:
Title: LOW COST LIQUID CRYSTAL WITH TOUCH PADS
Topic #: A90-349 Office: HDL ID #: 42125

UCE WILL INTEGRATE A LOW COST 64 X 240 PIXEL LCD WITH INTERFACE TOUCH PADS AND COMPUTER VARIABLE PROGRAM DISPLAY USING CONVENTIONAL, PROVEN AVAILABLE TECHNOLOGY. THE TOUCH PANEL WILL BE RESISTIVE. THE LOCATION TECHNIQUE WILL BE ANALOG. THIS WILL TAKE AWAY SOME BRIGHTNESS BUT IS A PROVEN RELIABLE TECHNIQUE WHOSE BRIGHTNESS IS USABLE AND IMPROVED UPON BY PLACING THE RESISTIVE LAYER AT DIFFERENT LEVELS IN THE SANDWICH CROSS SECTION. THE INITIAL PRODUCT WILL BE NON-U.S. SEMICONDUCTOR LCD DRIVERS, THESE WILL BE REPLACED WITH A U.S. MANUFACTURED DRIVER SYSTEM FROM A MIL-STD 883 LINE WITHIN 12-18 MONTHS (HUGHES). UCE IS AN ESTABLISHED SUPPLIER OF LCD HEATERS AND BACKLIGHTING AS APPROPRIATE TO A MIL MODULE.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482
ALBUQUERQUE, NM 87198
Program Manager: DR DAVID E MEREWETHER
Contract #:
Title: LOW MAINTENANCE DOOR CLOSURE
Topic #: A90-350 Office: HDL ID #: 42126

WE HOPE TO INVESTIGATE THE POTENTIAL USE OF AN ELECTROMAGNETIC DOOR SEAL AS A COMPONENT IN A LOW MAINTENANCE DOOR CLOSURE. THIS SEAL WILL INSERT A LOSSY FERROMAGNETIC MATERIAL

INTO THE PATH BY WHICH ELECTROMAGNETIC ENERGY ENTERS A SHIELDED ENCLOSURE AROUND THE PERIPHERY OF THE DOOR. THE MATERIAL IS EXPECTED TO REFLECT THE INCIDENT FIELD BECAUSE THE FERROMAGNETIC MATERIAL WILL OFFER A HIGH IMPEDANCE TO THE INCIDENT ELECTROMAGNETIC RADIATION. THE MATERIAL WILL ALSO ATTENUATE THE FIELD ENTERING THE ENCLOSURE THROUGH ATTENUATION OF THE ELECTROMAGNETIC WAVE PROPAGATION THROUGH THE LOSSY FERROMAGNETIC MATERIAL. THIS APPROACH HAS THE POTENTIAL OF PROVIDING A LOW MAINTENANCE SEAL BECAUSE THE ATTENUATION DOES NOT RELY ON METAL-TO-METAL CONTACT TO PROVIDE THE DESIRED SHIELDING EFFECTIVENESS. THE PHASE I EFFORT CONSISTS OF DETAILED DESIGN AND FABRICATION AND TESTING OF PROTOTYPE DOOR SEALS.

MISSION RESEARCH CORP
8560 CINDERBED RD - STE 700
NEWINGTON, VA 22122
Program Manager: KHANH NGUYEN
Contract #:
Title: AURORA RISE TIME SHARPENING WITH INDUCTIVE EROSION IN PRE-IONIZED PLASMA CHANNEL
Topic #: A90-352 Office: HDL ID #: 42127

A RESEARCH PROGRAM TO ANALYZE AND TO DEMONSTRATE THE FEASIBILITY OF A NEW TECHNIQUE TO SHARPEN THE BEAM PULSE RISE TIME OF THE AURORA FLASH GAMMA RAY SIMULATOR IS PROPOSED. THIS TECHNIQUE EMPLOYS THE INDUCTIVE EROSION PHENOMENA TO ERODE THE CURRENT RISE TIME OF THE AURORA BEAM PULSE, BY PROPAGATING IT THROUGH A PRE-IONIZED PLASMA CHANNEL ALONG THE AXIS OF THE EXISTING AURORA DRIFT TUBE. INDUCTIVE EROSION IS AN EXPERIMENTALLY VERIFIED PHYSICAL MECHANISM IN WHICH THE BEAM FRONT, IN EXPELLING THE CHANNEL ELECTRONS TO ESTABLISH CHARGE NEUTRAILITY, CONTINUALLY LOSES KINETIC ENERGY AND ERODES AWAY. SINCE THE CHARACTERISTIC TIME SCALE IS THE ACTUAL TIME TO EXPEL THE CHANNEL ELECTRONS TO THE DRIFT TUBE WALL, IT IS EXPECTED THAT THE RESULTING FINAL BEAM RISE TIME WILL BE ABOUT 2 NANOSECONDS. IN FACT, SUBSTANTIAL RISE TIME REDUCTIONS DUE TO THIS MECHANISM HAVE BEEN CONCLUSIVELY OBSERVED IN MODERATE CURRENT (~10 kA) PRE-IONIZED CHANNEL EXPERIMENTS. FURTHER, THIS MECHANISM IS ALSO SUSPECTED TO BE THE DOMINANT EROSION MECHANISM IN THE RECENT AURORA LOW PRESSURE NEUTRAL GAS CELL TECHNIQUE IN WHICH THE CHARACTERISTIC TIME SCALE IS THE CHANNEL ELECTRON EXPULSION TIME PLUS THE BEAM-INDUCED IONIZATION TIME (~10 ns). THUS, BY PREFORMING THE PLASMA CHANNEL, SUBSTANTIAL RISE TIME ENHANCEMENT CAN BE ACHIEVED IN ABOUT 3 METERS OF PROPAGATION, ACCORDING TO PRELIMINARY CALCULATIONS. THE OBJECTIVES OF THE PHASE I PROGRAM ARE TO PERFORM AN AURORA FEASIBILITY STUDY, TO IDENTIFY CRITICAL HARDWARE COMPONENTS FOR A SCALED EXPERIMENT ON AN ALTERNATIVE HDL FACILITY (E.G., TEMPO) THAT CAN BE PERFORMED IN THE EARLY PART OF PHASE II, AND TO ESTABLISH EXPERIMENTAL PARAMETERS FOR A PRELIMINARY HARDWARE DESIGN THAT COULD BE TESTED ON AURORA IN THE LATER PART OF PHASE II PROGRAM.

AERO-VIRONMENT INC
PO BOX 5031
MONROVIA, CA 91017
Program Manager: DR P B S LISSAMAN
Contract #:
Title: VORTEX SHEDDING MITIGATION METHODS
Topic #: A90-353 Office: HDL ID #: 42128

THERE IS A REQUIREMENT FOR EFFECTIVE METHODS TO MITIGATE WIND INDUCED VIBRATION IN ANTENNA STRUCTURES. THESE VIBRATIONS CAUSE DISTORTION IN THE SIGNAL. CURRENT ANTENNA STRUCTURES ARE CONSTRUCTED FROM FRP TUBING BECAUSE OF ITS BENIGN ELECTROMAGNETIC PROPERTIES BUT THE MATERIAL, BECAUSE OF ITS LOW STIFFNESS AND DAMPING PROPERTIES, AGGRAVATES WIND-INDUCED VIBRATIONS. THE VIBRATIONS ARE CAUSED BY EITHER KARMAN VORTEX SHEDDING FROM THE

INDIVIDUAL TUBES IN THE STRUCTURE, OR BY THE GUST RESPONSE CHARACTERISTICS OF THE STRUCTURE AS A WHOLE. A FOUR TASK PROGRAM IS OUTLINES IN WHICH BOTH OF THESE FORCING FUNCTIONS AND THEIR EFFECTS, IN TERMS OF THE SEVERITY OF VIBRATION THEY CAUSE IN THE ANTENNA, ARE TO BE INVESTIGATED. THIS WILL BE ACCOMPLISHED THROUGH A MODEL ANALYSIS OF THE ANTENNA STRUCTURE IN QUESTION BY UTILIZING FINITE ELEMENT METHODS. METHODS FOR SPOILING THE FORMATION OF THE SHED KARMAN VORTICES AS WELL AS CHANGING THE COMPLIANCY OF THE STRUCTURE AND ADDING VARIOUS DAMPING SYSTEMS WILL BE EVALUATED.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 260263
DENVER, CO 80226
Program Manager: DR RODNEY A PERALA
Contract #:
Title: DEVELOPMENT OF A HUYGENS' SURFACE EMP SIMULATOR (HSES)
Topic #: A90-354 Office: HDL ID #: 42129

AN INNOVATIVE CONCEPT FOR A NEW CLASS OF EMP SIMULATORS IS PROPOSED. THE ELECTROMAGNETIC EQUIVALENCE PRINCIPLE IS APPLIED TO PROVIDE A THREAT LEVEL SIMULATION WITH A BANDWIDTH GOAL OF 1 GHz AND ARBITRARY ANGLES OF INCIDENCE AND POLARIZATION ARE PROVIDED BY SOFTWARE. IT IS ENVIRONMENTALLY SOUND AND IS HIGHLY AUTOMATED. IT IS EXPECTED TO BE LESS EXPENSIVE TO PROCURE AND MAINTAIN THAN CONVENTIONAL MEGAVOLT TECHNOLOGY SIMULATORS.

MISSION RESEARCH CORP
8560 CINDERBED RD - STE 700
NEWINGTON, VA 22122
Program Manager: KHANH NGUYEN
Contract #:
Title: AURORA HIGH-POWER MICROWAVE GENERATION WITH PLASMA WAKEFIELD RELATIVISTIC KLYSTRON (PWRK)
Topic #: A90-355 Office: HDL ID #: 42130

THE AURORA FACILITY HAS GREAT POTENTIAL AS A HIGH-POWER MICROWAVE FACILITY. RECORD HIGH MICROWAVE POWER AND ENERGY COULD BE ACHIEVED, IF ONLY A SMALL FRACTION OF THE 3.6 TW ELECTRON BEAM POWER ON EACH OF THE FOUR OUTPUT LINES CAN BE COUPLED OUT. TO ACHIEVE THIS OBJECTIVE, WE PROPOSE A NEW CONCEPT TO GENERATE HIGH POWER MICROWAVES ON AURORA. THIS CONCEPT EMPLOYS PLASMA WAKEFIELD PHENOMENON TO BUNCH HIGH- CURRENT RELATIVISTIC ELECTRON BEAMS. MICROWAVE ENERGY IS EXTRACTED OUT OF THE BUNCHED BEAMS VIA ONE OR MORE RESONANT CAVITIES, SIMILAR TO THAT IN KLYSTRONS. IT APPEARS FROM INITIAL ESTIMATES THAT HIGH POWER MICROWAVE GENERATION AT A FREQUENCY ON THE ORDER OF 1 GHz WITH SEVERAL TENS OF PERCENT EFFICIENCY IS FEASIBLE. THE OBJECTIVES OF THE PHASE I PROGRAM ARE TO DETERMINE THE FEASIBILITY OF THE PROPOSED APPROACH ON AURORA WITH THEORY AND PIC SIMULATORS, TO DESIGN A PROOF-OF-PRINCIPLE EXPERIMENT TO BE PERFORMED ON TEMPO EARLY IN THE PHASE II PROGRAM, AND TO COMPLETE A CONCEPTUAL DESIGN OF A FULL AURORA EXPERIMENT TO BE IMPLEMENTED IN THE LATER PART OF THE PHASE II PROGRAM.

ROCHESTER PHOTONICS CORP
67 NETTLECREEK RD
FAIRPORT, NY 14450
Program Manager: DR DEAN FAKLIS
Contract #:
Title: APPLICATION OF SURFACE-RELIEF DIFFRACTIVE OPTICS TO ACOUSTO-OPTIC SIGNAL PROCESSORS

Topic #: A90-356 Office: HDL ID #: 42131

RECENT ADVANCES IN DIFFRACTIVE (OR BINARY) OPTICS TECHNOLOGY STRONGLY SUGGEST THAT DIFFRACTIVE OPTICS MAY PROVIDE A REVOLUTIONARY SOLUTION TO THE PROBLEM OF DEVELOPING COMPACT, RUGGED OPTICAL ASSEMBLIES FOR ACOUSTO-OPTIC (AO) SIGNAL PROCESSORS. SURFACE-RELIEF DIFFRACTIVE LENSES PROVIDE THE OPTICAL DESIGNER WITH ENOUGH DEGREES OF FREEDOM TO CORRECT FOR HIGHER-ORDER ABERRATIONS. FABRICATION TECHNIQUES EXISTS TO TAILOR THE PHASE PROFILE OF EACH ZONE; THIS PROVIDES A DIFFRACTIVE LENS THAT EXHIBITS HIGH DIFFRACTION EFFICIENCY. FOR MANY CASES OF PRACTICAL INTEREST, WE HAVE SHOWN THAT A SINGLE DIFFRACTIVE LENS ACTUALLY PERFORMS BETTER THAN CONVENTIONAL LENS SYSTEMS CON- SISTING OF SEVERAL AIR-SPACED GLASS ELEMENTS. THE PRIMARY OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEMONSTRATE THE FEASIBILITY OF UTILIZING DIFFRACTIVE OPTICS TECHNOLOGY TO ANSWER PERFORMANCE CON- STRAINTS IN COMPACT SPECTRUM ANALYZERS AND MINIBENCH TIME-INTEGRATING CORRELATORS. WE PROPOSE TO IDENTIFY INNOVATIVE DESIGNS THAT EMPLOY A MINIMUM OF OPTICAL ELEMENTS WITHOUT SACRIFICING PERFORMANCE OR LIGHT EFFICIENCY WHILE MAINTAINING MECHANICAL STABILITY. A SIGNICICANT PORTION OF THE RESEARCH WILL BE TO HELP ENHANCE EXISTING PROCESSOR PERFORMANCE THROUGH THE USE OF COMBINATIONS OF DIFFRACTIVE AND CONVENTIONAL COMPONENTS IN CURRENT DESIGNS. WE ALSO PLAN TO INVESTIGATE NOVEL USES OF DIFFRACTIVE OPTICS IN DESIGNS FOR NEXT- GENERATION SYSTEMS. THE MANUFACTURABILITY OF THE DIFFRACTIVE COMPONENTS WILL BE STUDIED. A FIRST-ORDER TOLERANCE ANALYSIS WILL BE UNDERTAKEN FOR THE MOST PROMISING DESIGNS. WE ALSO PLAN TO HELP DEFINE IMPORTANT ENVIRONMENTAL REQUIREMENTS INCLUDING STABLE MATERIALS AND RUGGED MECHANICAL MOUNTING TECHNIQUES. PHASE II RESEARCH AND DEVELOPMENT WILL CONCENTRATE ON FABRICATING PROTOTYPES OF A DESIGN USEFUL TO THE ARMY. IT IS EXPECTED THAT THE PHASE II DEVELOPMENT WILL LEAD TO SIGNIFICANTLY ENHANCE PROTOTYPE SYSTEMS.

EDC/AMCOMP
6905-G OAKLAND MILLS RD
COLUMBIA, MD 21045
Program Manager: TELEMACHOS J MANOLATOS
Contract #:
Title: FIRE SUPPORT APPLICATIONS OF GLOBAL POSITIONING SYSTEM TRANSPONDERS
Topic #: A90-357 Office: HEL ID #: 42133

THE PROPOSED PROGRAM INCLUDES ANALYSES AND INVESTIGATIONS TO DETERMINE THE MOST COST EFFECTIVE APPROACH FOR THE DESIGN OF A GPS TRANSPONDER SYSTEM FOR ARTILLERY REGISTRATION ROUNDS. THE GOALS FOR THE FINAL DESIGN INCLUDE A $300 COST AND A PACKAGE THAT WILL FIT IN THE STANDARD FUZE OGIVE. A BASIC SYSTEM CONCEPT IS PROPOSED AND PRELIMINARY DESIGN PARAMETERS PRESENTED. DESIGN ALTERNATIVES ARE ALSO DESCRIBED WHICH WILL BE PURSUED IN THE PROPOSED PROGRAM. PHASE I ALSO INCLUDES THE DESIGN AND EVALUATION OF A BREADBOARD TRANSPONDER SYSTEM, WHICH VERIFY PERFORMANCE CHARACTERISTICS AND PROVIDE A BASELINE DESIGN FOR PHASE II.

GALAXY MICROSYSTEMS INC
1710A RINGWOOD AVE
SAN JOSE, CA 95131
Program Manager: GEORGE AVERY
Contract #:
Title: DESIGN OF AN EXPENDABLE GPS TRANSPONDER SYSTEM
Topic #: A90-357 Office: HEL ID #: 42132

REDUCTION OF GPS TRANSPONDER VOLUME, WEIGHT, POWER CONSUMPTION AND COST IS NECESSARY TO STIMULATE A BROAD RANGE OF APPLICATIONS. THE PROGRAM OBJECTIVES OF A 10 CUBIC INCH VOLUME

AND A $300 UNIT COST ARE ONLY REALIZABLE IF THE COMPONENT COUNT CAN BE MINIMIZED. THE MONOLITHIC CO-INTEGRATION OF THIN FILM RESONATOR (TFR) FILTER FUNCTIONS WITH THE GPS TRANSPONDER ICs WILL YIELD THIS RESULT. A GPS TRANSPONDER DEMONSTRATION MODULE WILL BE DESIGNED AND FABRICATED TO VERIFY THE FEASIBILITY OF A 10 CUBIC INCH VOLUME IN PHASE I. A WORKING MODEL OF THE GPS TRANSPONDER THAT FITS INTO AN ARTILLERY ROUND FUZE CONFIGURATION WILL BE DESIGNED, FABRICATED AND TESTED IN PHASE II. THIS CONFIGURATION WILL UTILIZE SMT TECHNOLOGY AND WILL BE DESIGNED TO SURVIVE THE FIRING SHOCK OF 30,000 G'S.

INTELLIGENT TEXT PROCESSING INC
1310 MONTANA AVE
SANTA MONICA, CA 90403
Program Manager: KATHLEEN DAHLGREN
Contract #:
Title: IMPROVING DOCUMENT RETRIEVAL WITH NATURAL LANGUAGE UNDERSTANDING TECHNIQUES
Topic #: A90-359 Office: HEL ID #: 42134

THE GOAL OF THIS PROPOSED PROGRAM IS TO DEMONSTRATE THAT THE INCORPORATION OF ADVANCED NATURAL LANGUAGE PROCESSING TECHNIQUES INTO A DOCUMENT RETRIEVAL SYSTEM WILL SIGNIFICANTLY IMPROVE PERFORMANCE BOTH IN TERMS OF THE NUMBER OF RELEVANT DOCUMENTS RETRIEVED AND IN THE PRECISION WITH WHICH RELEVANT DOCUMENTS ARE SELECTED. EXISTING SYSTEMS ARE BASED ON KEYWORD SEARCHING ENHANCED BY STATISTICAL AND COMPUTATIONAL METHODS WITH SOME HUMAN INTERVENTION, USUALLY IN THE DOCUMENT INDEXING PROCESS. WHILE THESE METHODS HAVE BEEN PUSHED TO ACHIEVE A REASONABLE LEVEL OF SUCCESS, RESEARCHERS HAVE VERY NEARLY REACHED THE LIMITS OF SUCH METHODS AND LABOR-INTENSIVE HUMAN INTERVENTION BECOMES LESS AND LESS FEASIBLE WITH THE GROWING INFORMATION EXPLOSION. ADVANCED NATURAL LANGUAGE PROCESSING TECHNIQUES OFFER THE BEST HOPE OF BREAKING OUT OF THESE LIMITS BECAUSE THEY WOULD BRING TO THE RETRIEVAL TASK HUMAN-LIKE UNDERSTANDING CAPABILITIES. THESE INCLUDE DISAMBIGUATION OF WORD SENSES, IDENTIFICATION OF MAJOR PARTICIPANTS IN REPORTED EVENTS, ASSIGNMENT OF TEMPORAL AND CAUSAL RELATIONS BETWEEN REPORTED EVENTS, AND IDENTIFICATION OF TOPICS AND SUBTOPICS. THE TARGET SYSTEM WILL BE MORE PRECIE BECAUSE IT WILL LEVERAGE WHAT IS BEST IN EXISTING DOCUMENT RETRIEVAL TECHNOLOGY BY INTEGRATING IT WITH DEEP NATURAL LANGUAGE UNDERSTANDING BUILT ON NAIVE SEMANTIC KNOWLEDGE OF THE WORLD.

KNOWLEDGE SYSTEMS CONCEPTS INC
262 LIBERTY PLAZA
ROME, NY 13440
Program Manager: MICHAEL R THOMAS
Contract #:
Title: INTELLIGENT DOCUMENT RETRIEVAL
Topic #: A90-359 Office: HEL ID #: 42135

KSC IS A PRIVATELY OWNED RESEARCH AND DEVELOPMENT COMPANY THAT SPECIALIZES IN THE APPLICATION OF ADVANCED TECHNOLOGIES TO INFORMATION COLLECTION, ANALYSIS AND DISSEMINATION, AND TO THE DESIGN AND IMPLEMENTATION OF DECISION SUPPORT SYSTEMS. THE GOAL OF THIS PROJECT IS TO DEVELOP AN ADVANCED COMPUTER SYSTEM TECHNOLOGY THAT IS BASED ON EMERGING AI AND NATURAL LANGUAGE PROCESSING CAPABILITIES THAT CAN PERFORM RAPID RETRIEVAL AND ASSEMBLY OF INFORMATION FROM TEXTUAL DOCUMENTS. PHASE I OF THE EFFORT WILL INCLUDE A REVIEW AND ANALYSIS OF NEW TECHNOLOGY THAT IS BEING USED AND RESEARCHED IN GOVERNMENT, ACADEMIC AND INDUSTRY-SPONSORED R&D. THE OBJECTIVE OF THIS REVIEW AND ANALYSIS EFFORT IS TO IDENTIFY SPECIFIC ALGORITHMS AND TECHNIQUES THAT CAN BE USED TO CONSTRUCT A PROTOTYPICAL STATE-OF-THE-ART SYSTEM IN PHASE II. IN PHASE III, THE PROTOTYPICAL SYSTEM WILL

BE DEVELOPED INTO A COMMERCIAL PRODUCT.

CHI SYSTEMS INC
GWYNEDD PLAZA III - STE 200
SPRING HOUSE, PA 19477
Program Manager: JAMES H HICINBOTHOM
Contract #:
Title: INTELLIGENT INTERFACE CONSTRUCTION (IICON) WORKBENCH FOR DECISION AID GENERATION
Topic #: A90-360 Office: HEL ID #: 42136

CHI SYSTEMS PROPOSES TO EXTEND STATE-OF-THE-ART INTERFACE DESIGN AND CONSTRUCTION TOOLS TO ADDRESS THE DESIGN AND DEVELOPMENT OF PLANNING APPLICATIONS WITH DIRECT MANIPULATION GRAPHICAL USER INTERFACES CONSTRUCTED ON SUN WORKSTATIONS UNDER X WINDOWS AND OPEN SOFTWARE FOUNDATIONS' MOTIF STANDARD. THE PROPOSED INTELLIGENT INTERFACE CONSTRUCTION (IICON) WORKBENCH IS BASED ON EXISTING TOOLS DESIGNED AND DEVELOPED BY CHI SYSTEMS OVER SEVERAL INNOVATIVE INTELLIGENT INTERFACE DESIGN AND DEVELOPMENT EFFORTS. KEY INNOVATIONS INCLUDE A FORMAL SPECIFICATION TECHNIQUE WITH AUTOMATED TRANSLATION FROM OBJECT ANALYSIS INTO INTERFACE REQUIREMENTS, AND A NOVEL APPROACH TO INTEGRATION OF DOMAIN TASK KNOWLEDGE INTO THE DESIGN OF SCREEN LAYOUTS AND THE APPLICATIONS' STYLE OF INTERACTION.

FOSTER-MILLER INC
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Program Manager: WILLIAM E SCHROEDER
Contract #:
Title: COMBAT VEHICLE AUTOMATIC SIGHTING SYSTEM
Topic #: A90-361 Office: HEL ID #: 42137

ELECTRO-OPTICAL GUN CONTROL AND SIGHTING SYSTEMS IN CONVENTIONAL COMBAT VEHICLES USE MANUAL CONTROL DEVICES AND TRAINED OPERATORS WITH CONSIDERABLE HAND/EYE COORDINATION TO ACQUIRE AND TRACK THREATS IN THE BATTLEFIELD ENVIRONMENT. EXISTING WEAPON STABILIZATION SYSTEMS CAN BE READILY RETROFITTED FOR AUTOMATIC CONTROL TO SIMPLIFY THESE TASKS AND IMPROVE PERFORMANCE. THIS PROGRAM PROPOSES TO INTRODUCE BOTH AUTOMATIC TARGET TRACKING AND EYE-SLAVE "LOOK AND LOCK" TARGET ACQUISITION INTO THE COMBAT VEHICLE COCKPIT. THE HUMAN EYE IS POTENTIALLY AN IDEAL INPUT DEVICE FOR MAN/FIRE CONTROL INTERFACE FOCUS THE EYE'S LINE OF GAZE. LINE OF SIGHT CAN BE AUTOMATICALLY ACQUIRED BY CURRENT TRACKING TECHNOLOGY, AND USED AS A CONTROL SYSTEM INPUT. COMBINATION OF AUTO-TRACKING AND "LOOK AND LOCK" WILL ALLOW RAPID DESIGNATION OF TARGETS WHICH WILL SUBSEQUENTLY BE AUTOMATICALLY MAINTAINED IN THE LINE OF FIRE. ACQUISITION WILL BE DIRECTED BY LOOKING AT THE TARGET, AND CUED BY A SINGLE BINARY COMMAND. THE EYE-DRIVEN CURSOR REDUCES THE REQUIREMENT FOR SPECIALIZED HAND-EYE COORDINATION SKILLS. IN PHASE I WE PROPOSE TO BUILD A DEMONSTRATION PROTOTYPE FOR THIS CONCEPT WHICH WILL LEAD TO LOW-COST INSTRUMENTATION TO IMPROVE PERFORMANCE OF TARGET CUEING, WEAPON CONTROL, AND HANDOFF, AND REDUCE THE SPECIFIC SKILL BURDEN ON THE FIRE CONTROL OPERATOR.

DYNAMIC SYSTEM TECHNOLOGIES INC
201 NEWBERRY RD
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Program Manager: WADI RAHIM
Contract #:
Title: FEEDBACK LIMITED CONTROL SYSTEM FOR LOW DATA RATE REMOTE DRIVING

Topic #: A90-363 Office: HEL ID #: 42138

REMOTELY OPERATED UNMANNED GROUND VEHICLES (UGVs) ARE SEVERELY RESTRICTED BY THE AVAILABILITY OF A HIGH BANDWIDTH COMMUNICATIONS LINK. REMOTE DRIVING OF UGVs IS CONDUCTED BY VIEWING VIDEO FROM A VEHICLE MOUNTED CAMERA. BECAUSE OF THE SEVERELY CROWDED ELECTRO- MAGNETIC SPECTRUM, THIS VIDEO HAS TO BE TRANSMITTED BACK TO THE REMOTE CONTROL STATION VIA A NARROW BAND DATA LINK. THE RESULTING VIDEO FREQUENTLY HAS A REDUCED FRAME RATE AS WELL AS REDUCED RESOLUTION. MAINTAINING THE NECESSARY HIGH CONTROL BANDWIDTH WITH THE OPERATOR IN THE CONTROL LOOP IS NOT POSSIBLE USING CONVENTIONAL TECHNIQUES WITH SUCH VIDEO. FEEDBACK LIMITED CONTROL SYSTEM (FELICS) PROVIDES A TECHNIQUE TO OVERCOME THIS CONTROL BANDWIDTH RESTRICTION. THE COMPUTER ASSISTED TECHNIQUE ALLOWS THE OPERATOR TO RETAIN ABSOLUTE COMMAND AUTHORITY, BUT RELIEVES HIM OF MUCH OF THE CONTROL BURDEN. THE TECHNIQUE REQUIRES THE OPERATOR TO PAINT THE DESIRED PATH ON THE VIDEO IMAGERY. THE SYSTEM DRIVES THE VEHICLE ALONG THE PAINTED PATH. FELICS PERMITS THE OPERATOR TO CONTINUOUSLY PAINT THE PATH AS THE VIDEO IMAGERY IS REFRESHED, SO PRODUCING A CONTINUOUS AND SMOOTH CONTROL OF THE UGV.

CARDINAL SCIENTIFIC INC
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WALDORF, MD 20601
Program Manager: ANDREW BROSKY
Contract #:
Title: HIGH DEXTERITY TELEROBOTIC END EFFECTOR
Topic #: A90-364 Office: HEL ID #: 42142

PHASE I RESEARCH WILL FOCUS ON PRECISION MECHANICAL DESIGN WITH MODULAR APPROACHS TO SENSOR INTEGRATION. THE DESIGN WILL INCORPORATE THE INNOVATIVE CONCEPT OF MAXIMIZING TOTAL DEGREES OF FREEDOM, YET PRESERVING THE ABILITY TO REMOVE OR LIMIT UNDER-UTILIZED MOTION. PRACTICAL DETERMINATIONS WILL BE MADE REGARDING THE DEGREE OF DEXTERITY REQUIRED, LOAD CAPACITY, PHYSICAL SIZE AND GRIPPING RANGE. COMPUTER-AIDED DESIGN (CAD) TECHNIQUES, SOLIDS MODELLING AND FINITE ELEMENT ANALYSIS (FEA) WILL BE EMPLOYED TO ACHIEVE KINEMATIC AND STRUCTURAL OPTIMIZATION OF THE SYSTEM. CAPACITY, SIZE, WEIGHT, STEP RESPONSE AND INCREMENTAL ACCURACY WILL BE EVALUATED COLLECTIVELY TO DETERMINE A RECOMMENDED ELECTRICAL, HYDRAULIC OR PNEUMATIC ACTUATOR. THE MODULAR APPROACH WILL MAINTAIN FLEXIBILITY TO INTERCHANGE VARIOUS ACTUATORS AND ACTUATOR CAPACITIES. THE INDIVIDUAL DIGITS WILL SERVE AS FLEXIBLE PLATFORMS FOR INTERCHANGING SENSORS AS TECHNOLOGY EVOLVES INTO PROVEN APPLICATIONS. PROXIMITY AND TACTILE SENSING METHODS WILL BE RESEARCHED AND EVALUATED FOR IMPACTS AND RELEVANCE TO THE DESIRED TASKS AND CONTROLLER CAPABILITIES. HIGH LEVEL LANGUAGE COMPILERS AND INTERACTIVE DEBUGGING WILL FACILITATE SOFTWARE DEVELOPMENT. A DESIGN REVIEW BOARD WILL BE CONVENED TO EMERGE WITH DEFINED SYSTEM SPECIFIC HARDWARE TO MEET THE MANIPULATOR REQUIREMENTS OF THE ARMY'S DEXTEROUS END EFFECTOR TESTBED. DETAILED RECOMMENDATIONS WILL BE DEVELOPED FOR PHASE II RESEARCH AND PROTOTYPE DEVELOPMENT.

PARALLAX RESEARCH & DEVELOPMENT
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Program Manager: GEOFREY C SHOWALTER
Contract #:
Title: HIGH DEXTERITY TELEROBOTIC END EFFECTOR
Topic #: A90-364 Office: HEL ID #: 42141

A SPECIFIC TECHNICAL OPPORTUNITY EXISTS TO DEVELOP A MULTI-DIGIT ROBOTIC END EFFECTOR WHICH

IS SUFFICIENTLY ROBUST TO MANIPULATE HEAVY OBJECTS YET ADEQUATELY SENSITIVE TO ARM, OR DISARM, THE MOST SENSITIVE MUNITION. THIS END EFFECTOR MUST POSSESS ADEQUATE ADEQUATE SPEED TO ACCOMPLISH GIVEN TASKS IN A REASONABLE AMOUNT OF TIME, AND MUST BE BOTH INEXPENSIVE TO PRODUCE AND MAINTAIN. THE OPPORTUNITY FOR DEVELOPING AN END EFFECTOR OF THIS TYPE IS SIGNIFICANT IN ITS POTENTIAL USE IN THE PERFORMANCE OF THOSE TASKS WHICH ARE NOT IDEALLY SUITED FOR HUMAN PERFORMANCE, WHETHER CONSIDERED MUNDANE AND LABOR INTENSIVE, OR HAZARDOUS. SUCH TASKS MAY INCLUDE ORDNANCE DISPOSAL, MUNITION HANDLING, SPACE PLATFORM AND DEEP SEA OIL WELL FABRICATION AND MAINTENANCE, AND NUCLEAR AND HAZARDOUS MATERIALS OPERATIONS. CURRENTLY, MANY OF THE MULTI- DIGIT END EFFECTORS UNDER STUDY POSSESS SUFFICIENT SPEED AND SENSITIVITY, HOWEVER, THEY ARE LIMITED IN THEIR ABILITY TO MANIPULATE HEAVY PAYLOADS.

QUEST INTEGRATED INC
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Program Manager: JOHN C HAKE
Contract #:
Title: HIGH DEXTERITY TELEROBOTIC END EFFECTOR
Topic #: A90-364 Office: HEL ID #: 42140

PROPOSED IS THE CREATION OF A PRELIMINARY DESIGN FOR A HIGH-DEXTERITY, MULTIDIGIT, TELEROBOTIC END EFFECTOR TESTBED, ITS COMPUTER CONTROLLER, AND A FORCE-REFLECTING MAN-MACHINE INTERFACE. THIS PRELIMINARY DESIGN WILL EVENTUALLY LEAD TO THE DEVELOPMENT OF A WORKING TESTBED FOR USE IN DEVELOPING CONTROL SOFTWARE FOR A VARIETY OF ARMY APPLICATIONS REQUIRING THE USE OF DEXTROUS MANIPULATORS ON TELEROBOTIC OR AUTONOMOUSLY CONTROLLED ROBOTS. THE MULTIDIGIT, SENSOR-EQUIPPED END EFFECTOR WILL BE CAPABLE OF HIGHLY DEXTROUS MOVEMENT WHILE PROVIDING SUFFICIENT PAYLOAD CAPACITY AND ROBUSTNESS TO OPERATE IN REAL MILITARY APPLICATIONS. DATA FROM TACTILE AND PROXIMITY SENSORS INTEGRATED INTO THE END EFFECTOR WILL BE SUPPLIED TO THE OPERATOR THROUGH THE MAN-MACHINE INTERFACE. THE END EFFECTOR WILL ALSO BE EQUIPPED WITH FORCE SENSORS TO PROVIDE A FORCE-REFLECTING MODE OF OPERATION AT THE MAN-MACHINE INTERFACE. THE USE OF NEURAL NETWORKS FOR GENERATING JOINT LOCATIONS AND ACTUATOR TORQUES FOR THE END EFFECTOR DIGITS AND THE FORCE-REFLECTING MAN-MACHINE INTERFACE WILL BE EXPLORED.

SARCOS RESEARCH CORP
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SALT LAKE CITY, UT 841[illegible]
Program Manager: EDWIN K IVERSEN
Contract #:
Title: MULTI-DIGIT SENSOR EQUIPPED TELEROBOTIC END EFFECTOR AND WRIST
Topic #: A90-364 Office: HEL ID #: 42139

SRC HEREIN PROPOSES TO APPLY RECENTLY DEVELOPED PROVEN TECHNOLOGIES TO THE DEVELOPMENT OF A MULTI DIGIT SENSOR EQUIPPED, TELEROBOTIC END EFFECTOR/WRIST SYSTEM; THIS SYSTEM WOULD BE SUITABLE AS A RUGGED TESTBED FOR EVALUATING POTENTIAL DEXTROUS TELEOPERATION APPLICATIONS. THE TELEOPERATION SYSTEMS RECENTLY DEVELOPED BY SARCOS RESEARCH CORPORATION (SRC) AND THE CENTER FOR ENGINEERING DESIGN (CED) HAVE SHOWN SIGNIFICANT ADVANCES. FEATURES WHICH HAVE BEEN RESPONSIBLE FOR SOME OF THESE ADVANCES INCLUDE: 1) WRISTS WITH INTERSECTING AXES OF ROTATION, EXTENDED RANGE OF MOTION, AND CLOSELY POSITIONED END EFFECTORS· 2) HIGH FIDELITY AND HIGH BANDWIDTH FORCE REFLECTION; AND 3) MULTIPURPOSE END EFFECTORS WITH CLOSE SPATIAL CORRESPONDENCE OR MAPPING BETWEEN THE OPERATOR COMMAND MOVEMENTS AND RESULTING REMOTE MANIPULATOR MOVEMENTS. THESE RECENTLY DEVELOPED SYSTEMS HAVE EXTENDED ACHIEVABLE REMOTE MANIPULATION CAPABILITIES

FROM SLOW POSITIONING TASKS TO THOSE TASKS REQUIRING HIGH FIDELITY, HIGH BANDWIDTH FORCE AND POSITION CONTROL SUCH AS: PUTTING A #10-32 NUT ON A BOLT, ASSEMBLING A 3/8 INCH PIN INTO A SHACKLE AND OPENING, CLOSING AND REMOVING THE VALVE STEM ON 1/2 INCH VALVE.

TRIANGLE RESEARCH & DEVELOPMENT CORP
PO BOX 12696
RSCH TRIANGLE PK, NC 27709
Program Manager: DONALD R MYERS
Contract #:
Title: A MODULAR SENSOR-DRIVEN END EFFECTOR FOR USE IN A TELEROBOTIC TESTBED
Topic #: A90-364 Office: HEL ID #: 42143

MOST PREVIOUS END EFFECTOR DESIGNS CAN BE GROUPED INTO TWO CATEGORIES: SIMPLE GRIPPERS AND COMPLEX ANTHROPOMORPHIC HANDS. SINCE THE GRASPING REQUIREMENTS OF MOST PRACTICAL APPLICATIONS ARE UNIQUE, SPECIAL-PURPOSE GRIPPERS HAVE BEEN DESIGNED TO MEET THE SPECIFIC NEEDS OF EACH APPLICATION. DEXTEROUS ANTHROPOMORPHIC HANDS REMAIN TOO COMPLEX FOR USE OTHER THAN IN RESEARCH LABS. A DESIGN FOR AN EFFECTOR WHICH COMBINE THE SIMPLICITY CHARACTERISTIC OF THE SIMPLE GRIPPERS WITH SOME OF THE VERSATILITY OF COMPLEX HANDS IS PROPOSED. AN EFFECTOR IS REQUIRED WHICH IS CAPABLE OF ACHIEVING A LARGE NUMBER OF GENERIC GRASP CONFIGURATIONS WITH A MINIMUM NUMBER OF ACTUATORS. THE EFFECTOR WILL CONSIST OF MODULAR LINKAGE WITH ACTUATORS WHICH CAN BE INTERCHANGED AS REQUIRED. SENSORS WILL BE SELECTED FROM PROVEN COMMERCIAL TECHNOLOGIES. A DESK TOP COMPUTER WITH OPEN BUS ARCHITECTURE WILL SERVE AS CONTROLLER TO PERMIT INTERCHANGE OF CONTROLLER COMPONENTS. THE SOFTWARE ARCHITECTURE WILL CONFORM TO THE RCS FRAMEWORK.

WORKING MACHINES INC
920 FRANKLIN TER
MINNEAPOLIS, MN 55406
Program Manager: H KAZEROONI
Contract #:
Title: HIGH DEXTERITY TELEROBOTIC END EFFECTOR: A PRELIMINARY INVESTIGATION ON ROBOTIC SYSTEMS WORN BY HUMANS
Topic #: A90-364 Office: HEL ID #: 50321

THIS PROPOSAL INTRODUCES A NEW CLASS OF ROBOT MANIPULATORS CALLED "EXTENDERS". EXTENDERS ARE WORN BY HUMANS AND INCREASE HUMAN MECHANICAL ABILITY, WHILE THE HUMAN'S INTELLECT SERVES AS THE CENTRAL INTELLIGENT CONTROL SYSTEM FOR MANIPULATING THE EXTENDER. THE HUMAN BODY, IN PHYSICAL CONTACT WITH THE EXTENDERS, EXCHANGES POWER AND INFORMATION SIGNALS WITH THE EXTENDER. THIS PROJECT'S OBJECTIVE IS TO DEVELOP GROUND RULES FOR THE CONTROL OF ROBOTIC SYSTEMS WORN BY HUMANS THROUGH THE DESIGN, CONSTRUCTION, AND CONTROL OF A SIMPLE EXPERIMENTAL EXTENDER. THIS KNOWLEDGE WILL BE THE BASIS FOR THE DESIGN AND CONSTRUCTION OF A MULTI-DEGREE-OF-FREEDOM EXTENDER IN PHASE II. THIS RESEARCH WILL DETERMINE THE FUNDAMENTAL ENGINEERING REQUIREMENTS FOR THE DESIGN AND CONTROL OF ACTIVE MACHINES WORN BY HUMANS. WE WILL CONDUCT A SERIES OF THEORETICAL- EXPERIMENTAL STUDIES ON THE CONTROL AND PERFORMANCE OF AN EXPERIMENTAL NON-DIRECT-DRIVE EXTENDER. WE WILL DERIVE AND EXPERIMENTALLY VERIFY THE MATHEMATICAL FRAMEWORK FOR THE DESIGN OF THE EXTENDER CONTROLLER.

WORKING MACHINES INC
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MINNEAPOLIS, MN 55406
Program Manager: H KAZEROONI

Contract #:
Title: HIGH DEXTERITY TELEROBOTIC END EFFECTOR: DESIGN AND CONSTRUCTION OF AN EXPERIMENTAL HUMAN AMPLIFIER
Topic #: A90-364 Office: HEL ID #: 50323

THIS PROPOSAL INTRODUCES TWO CONCEPTS: 1) "TELEFUNCTIONING, AND 2) A CONTROL METHOD FOR ACHIEVING TELEFUNCTIONING. IN TELEFUNCTIONING, THE DYNAMIC BEHAVIORS OF THE SLAVE ROBOT AND THE MASTER ROBOT ARE FUNCTIONS OF EACH OTHER; THESE FUNCTIONS ARE THE DESIGNER'S CHOICE AND DEPEND ON THE APPLICTION. IN TELEPRESENCE, A SUBCLASS OF TELEFUNCTIONING, ALL THE RELATIONSHIPS BETWEEN THE MASTER AND THE SLAVE ARE SPECIFIED AS "UNITY" SO THAT ALL THE MASTER AND SLAVE VARIABLES (E.G., POSITION, VELOCITY) ARE DYNAMICALLY EQUAL. WE WILL DETERMINE A CONTROL LAW FOR TELEROBOTICS WHICH WILL ACHIEVE TELEFUNCTIONING. THE CONTROLLER DESIGN WILL BE BASED ON DYNAMIC MODELS OF THE HUMAN ARM AND THE ENVIRONMENT. WE WILL APPRAIE THE SYSTEM PERFORMANCE BY EVALUATING EXPERIMENTALLY THE PERFORMANCE SPECIFICATIONS AND THE SYSTEM STABILITY AND COMPARE THOSE RESULTS WHEN TELEPRESENCE GOVERNS THE SYSTEM PERFORMANCE.

GUMBS ASSOCS INC
11 HARTS LN
EAST BRUNSWICK, NJ 08816
Program Manager: DR P CHANDRA SEKHAR
Contract #:
Title: ULTRAFAST PASSIVE SHIELDS FOR LASERS AND BALLISTIC PROTECTION BASED ON SEMICONDUCTOR/CONDUCTING POLYMER INTERFACES
Topic #: A90-365 Office: MTL ID #: 42146

A NOVEL TECHNOLOGY FOR PASSIVE, SWITCHABLE (DYNAMIC), BROAD-BAND (VIS. -NIR), ULTRAFAST (SUB-ns) LASER SHIELDS IS OFFERED, BASED ON INTERFACING INORGANIC SEMICONDUCTOR ELECTRODE TO CONDUCTING POLYMERS. THE CONDUCTING POLYMERS, NORMALLY SWITCHED ELECTROCHEMICALLY BETWEEN OPAQUE AND TRANSPARENT STATES, ARE IN THIS TECHNOLOGY SWITCHED VIA DIRECT CHARGE TRANSFER FROM ULTRAFAST LASER PHOTO- EXCITATION OF THE SEMICONDUCTOR ELECTRODES; THE LATTER THUS PROVIDE BOTH THE TRIGGER AND THE ENERGY FOR THE POLYMER SWITCHING. PRELIMINARY PULSED LASER DATA FOR SWITCHING OF SEMICONDUCTOR/CONDUCTING POLYMER INTERFACES, COLLECTED AT THE STATE-OF-THE-ART ps-REGIME LASER FACILITIES OF THE REGIONAL LASER AND BIOTECHNOLOGY LABORATORIES (RLBL), U. OF PA, PHILADELPHIA, SHOW SUB-ns RISETIMES AND FALLTIMES IN THE TENS OF ns, WITH LARGE OD CHANGES (DATA INCLUDED HEREIN). EXTENSIVE PRIOR EXPERIENCE AT GUMBS SPECIFICALLY IN THE DEVELOPMENT OF LASER SHIELDS, A CLOSE, TWO-YEAR COLLABORATION WITH RLBL, AND PRIOR WORK IN THE DEVELOPMENT OF NOVEL CONDUCTING POLYMERS THAT ARE SOLUBLE AND PROCESSIBLE SUPPORTS THE PROPOSED WORK. THE ADAPTATION OF THE SC/CP INTERFACES FOR BALLISTIC PROTECTION IS ALSO DESCRIBED.

PLASMATRON INC
504 IRON WOOD WY
DRESHER, PA 19025
Program Manager: DR M A EL-SHERIF
Contract #:
Title: A NOVEL EMBEDDED FIBER OPTIC SENSOR FOR COMPOSITE STRUCTURE CHARACTERIZATION
Topic #: A90-366 Office: MTL ID #: 42147

A COMPREHENSIVE STUDY LEADING TO THE DEVELOPMENT OF A NOVEL TECHNIQUE FOR A SENSITIVE AND INEXPENSIVE EMBEDDED FIBER OPTIC SENSOR IS PROPOSED. THE FIBER OPTIC SENSOR WILL OPERATE ON THE PRINCIPLE OF MODAL POWER DISTRIBUTION (MPD) MODULATION IN MULTIMODE FIBERS CAUSED BY

MECHANICAL AND ENVIRONMENTAL DISTRUBANCES IN THE SMART MATERIALS. THE THEORETICAL AND EXPERIMENTAL INVESTIGATION WILL BE DIRECTED TOWARD THE THREE BASIC OBJECTIVES; ADDRESSING THE FUNDAMENTAL FIBEROPTIC SENSOR PERFORMANCE UTILIZING THE MODAL POWER DISTRIBUTION TECHNIQUE, THE PROCESSING-STRUCTURE-SENSOR INTERACTION, AND A COMPOSITE-SENSOR SYSTEM PERFORMANCE EVALUATION. THE STRATEGY FOR THE PROPOSED RESEARCH IS TO USE THE MODAL POWER DISTRIBUTION IN OPTICAL FIBERS AS A HIGHLY SENSITIVE TOOL FOR MEASUREMENTS OF STRUTURAL RESPONSE OF VARIOUS MODES OF PERTURBATION. THIS TECHNIQUE WILL BE APPLIED FOR SENSING THESE PERTURBATIONS BY COMPARATIVE MEASUREMENTS OF MODAL POWER DISTRIBUTION AND SUBSEQUENT REDISTRI- BUTION AT THE OUTPUT END OF THE FIBER. IN A PRELIMINARY INVESTIGATION, CARRIED OUT IN THE LAST FEW MONTHS, RESULTS INDICATE THAT THIS DEVELOPED TECHNIQUE IS HIGHLY SENSITIVE, INEXPENSIE, AND WELL SUITED FOR SMART STRUCTURE APPLICATIONS. TO OPTIMIZE THE SENSOR CONFIGURATION, AN EXTENSIVE STUDY OF SENSITIVITY AND DYNAMIC RANGE OF THE SENSOR WILL BE INVESTIGATED. THIS WORK WILL INCLUDE THE DEVELOPMENT OF AN APPROPRIATE MODEL FOR EVALUATION OF EXTERNAL PERTURBATION.

QUADRAX ADVANCED MATERIALS SYSTEMS INC
300 HIGH POINT AVE
PORTSMOUTH, RI 02871
Program Manager: ROBERT A FLORENTINE
Contract #:
Title: LOW COST HIGH PERFORMANCE CONTINUOUS FIBER CERAMIC COMPOSITES: 3-D BRAIDED PREFORMS AS SiC MATRIX COMPOSITES USING CVI
Topic #: A90-367 Office: MTL ID #: 42148

3-D BRAIDED PREFORMS SHOULD INCREASE MECHANICAL PROPERTIES OF CERAMIC COMPOSITES IN ALL DIRECTIONS; ITS INTERLOCKING FIBER ARCHITECTURE SHOULD BE EFFECTIVE IN ARRESTING CRACKS, AND REMOVING CATASTROPIC FAILURE. THIS PROJECT ADDRESSES THE ISUES OF MERGING AN EFFECTIVE REINFORCEMENT SYSTEM WITH AN INEXPENSIVE CERAMIC MATRIX PROCESSING TECHNOLOGY TO DISCOVER A LOW COST MANUFACTURING ROUTE TO HIGH PERFORMANCE CERAMIC COMPOSITE SHAPES. CVI IS AN INFILTRATION TECHNOLOGY THAT PROVIDES HIGH QUALITY CERAMIC MATRICES IN COMPOSITES. ITS USE WITH THE 3-D BRAIDED PREFORMS IS EXPECTED TO MEET AND EXCEED REQUIREMENTS FOR THIS PROJECT. THE ULTIMATE COST TO FABRICATE SUCH COMPOSITES WILL BE A SIGNIFICANT FACTOR IN SOME APPLICATIONS; ONCE THE PERFORMANCE LEVEL HAS BEEN DEFINED, REDUCTIONS IN MANU- MANUFACTURING COSTS CAN FOLLOW, OPTIMIZING THE EFFICIENCY OF THIS SYSTEM; ALTERNATE SYSTEMS MAY ULTIMATELY PROVE ATTRACTIVE, COST WISE. IN THIS PHASE I, ENOUGH PROCESSING TRIALS WILL BE MADE TO PRODUCE A REPRESENTATIVE MATRIX TO HOST THE PREFORM. PREDICTION OF OF MECHANICAL PROPERTIES BASED ON BRAID GEOMETRY AND FIBER PROPERTIES WILL DETERMINE THE VALIDITY OF THE APPROACH TO CERAMIC COMPOSITES.

3C SYSTEMS INC
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Program Manager: MURRAY KORNHAUSER
Contract #:
Title: DEVELOPMENT OF TUNGSTEN BASED COMPOSITES
Topic #: A90-368 Office: MTL ID #: 42149

IT IS PROPOSED TO DEVELOP AND EMPLOY TWO ADVANCED TECHNOLOGICAL TOOLS IN THE CONTINUING R&D PROBLEM TO DEVELOP IMPROVED TUNGSTEN BASED COMPOSITE MATERIALS TO BE USED IN KINETIC ENERGY PENETRATORS: (1) THE HOT ISOSTATIC PRESSING (HIP) PROCESS WILL BE EMPLOYED TO FABRICATE THE MOST PROMISING TUNGSTEN-CERAMIC (CERMET) MATERIAL COMBINATIONS. (2) IN ORDER TO OBTAIN DYNAMIC MATERIAL PROPERTIES AND ULTIMATE STRENGTHS, IT IS PROPOSED TO DEVELOP THE

ELECTROMAGNETIC HOPKINGSON BAR (EHB) FACILITY, WHICH WILL HAVE THE CAPACITY TO TEST TUNGSTEN BASED SPECIMENTS TO STRESSES OF THE ORDER OF 800,000 psi. THIS UNIQUE LABORATORY DEVICE WILL BE DEVELOPED BY MODIFYING THE EXISTING 200,000 SHOCK TEST FACILITY THROUGH ADDITION OF A SEGMENTED HOPKINSON BAR. THE MATERIALS SELECTED FOR TEST IN PHASE I INCLUDE W-AlN, W-AlN + EXTERIOR, W-Cu, W-TiB(2), AND W-SiC WHISKERS. THESE MATERIALS WILL BE FABRICATED USING THE HIP PROCESS, AND THEIR DYNAMIC PROPERTIES WILL BE EVALUATED WITH THE EHB FACILITY. RECOMMENDATIONS WILL BE MADE ON THE DIRECTION OF MATERIALS R&D TO BE PURSUED IN PHASE II.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
Program Manager: BRIAN E WILLIAMS
Contract #:
Title: TITANIUM- AND HAFNIUM-COATED TUNGSTEN POWDERS FOR KINETIC ENERGY PENETRATORS
Topic #: A90-368 Office: MTL ID #: 42150

DEPLETED URANIUM (DU) IS THE STATE-OF-THE-ART MATERIAL FOR KINETIC ENERGY PENETRATORS USED TO DEFEAT STEEL AND COMPOSITE ARMORS. DU ALLOYS, HOWEVER, ARE COSTLY TO FABRICATE, HANDLE, AND STORE BECAUSE OF AN EXTREMELY COMPLEX METALLURGY AND THE OBVIOUS HEALTH FACTOR ASSOCIATED WITH THE USE OF URANIUM. TUNGSTEN COMPOSITE MATERIALS ARE ALSO USED IN KINETIC ENERGY PENETRATORS, OFFERING EASIER AND SAFER FABRICATION, HANDLING, AND STORAGE BUT TO DATE LACKING THE PERFORMANCE OF DU. THE MECHANISMS BY WHICH A PENETRATOR DEFEATS AN ARMOR ARE DIFFICULT TO DETERMINE, BOTH EXPERIMENTALLY AND FROM FIRST PRINCIPLES. RECENT EXPERIMENTS HAVE IDENTIFIED THE PRESENCE OF AN "ADIABATIC SHEAR" MECHANISM THAT APPEARS TO BE IMPORTANT IN THE PENETRATION OF ROLLED HOMOGENEOUS ARMOR BY DU PENETRATORS. IN THIS PHASE I PROGRAM, ULTRAMET PROPOSES TO APPLY TITANIUM AND HAFNIUM COATINGS TO TUNGSTEN PARTICLES BY CHEMICAL VAPOR DEPOSITION (CVD) USING AN ESTABLISHED FLUIDIZED-BED POWDER COATING TECHNIQUE. BOTH TITANIUM AND HAFNIUM ARE KNOWN TO EXHIBIT THE ADIABATIC SHEAR PHENOMENON. HIGH STRAIN RATE EXPERIMENTS (~ 10(4)/sec) WILL BE PERFORMED TO ESTABLISH THE PRESENCE OR ABSENCE OF THIS MODE OF DEFORMATION IN SMALL CYLINDRICAL SPECIMENS OF Ti/W AND Hf/W COMPOSITES.

ADVANCED FUEL RESEARCH INC
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Program Manager: PETER R SOLOMON
Contract #:
Title: HIGH TEMPERATURE OXYGEN INDEX APPARATUS
Topic #: A90-369 Office: MTL ID #: 42151

TO PROVIDE A REALISTIC FIRE RESISTANCE RANKING OF HIGH TEMPERATURE MATERIALS, LIMITING OXYGEN INDEX (LOI), MEASUREMENTS SHOULD BE MADE AT ELEVATED TEMPERATURE. THE MORE FIRE RESISTENT THE MATERIAL, THE HIGHER THE TEMPERATURE REQUIRED. CURRENT COMMERCIAL INSTRUMENTS HAVE THE CAPABILITY OF OPERATING UP TO 400 DEG C. HOWEVER, IMPROVED MATERIALS, ESPECIALLY COMPOSITES, REQUIRE EVEN HIGHER TEMPERATURE MEASUREMENTS. ADVANCED FUEL RESEARCH, INC. (AFR) HAS AN EXISTING TRANSPARENT WALL REACTOR (TWR), MEASUREMENT INSTRUMENTS, AND KNOW HOW NEEDED TO DESIGN AN LOI TEST APPARATUS CAPABLE OF OPERATING AT TEMPERATURES FROM 400 TO 800 DEC G. THE EXISTING FACILITY PROVIDES A COLUMN OF PREHEATED GAS WITH UNIFORM TEMPERATURES OVER A VOLUME 80 mm IN DIAMETER BY 200 mm HIGH. THIS VOLUME IS SUFFICIENT FOR A TYPICAL TET SPECIMEN. TO DESIGN AN LOI TEST APPARATUS, IT IS IMPORTANT TO UNDERSTAND THE SPECIMEN HEATING AND COMBUSTION BEHAVIOR. TO PERFORM THIS FUNCTION, AFR'S TWR HAS A COUPLED FOURIER TRANSFORM INFRARED (FT-IR) SPECTROMETER CAPABLE OF MAKING

MEASUREMENTS OF GAS CONCENTRATIONS AND TEMPERATURE AND SPECIMEN SURFACE TEMPERATURES. AN IMPORTANT FEATURE OF THE FINAL TEST APPARATUS WILL BE THE MAINTENANCE OF A UNIFORM TEMPERATURE AT THE FLAME FRONT. SEVERAL POSSIBILITIES INCLUDING AN EXTENSION OF STANTON REDCROFT'S GRADED COLUMN HEATER AND THE USE OF A BUFFER GAS LAYER (AS IN THE TWR) WILL BE TESTED. WE WILL ALSO EXPLORE THE POSIBILITY OF SENSING THE FLAME FRONT AND USING A FEEDBACK LOOP AND TRANSLATION APPARATUS TO KEEP THE FLAME FRONT AT A CONSTANT ELEVATION. DURING PHASE I, WE WILL MODIFY THE TWR TO ALLOW TESTING OF STATIONARY AND TRANSLATING SOLID SAMPLES, AND MAKE MEASUREMENTS AT TEMPERATURES OF 400, 5000, 600, 700, AND 800 DEG C ON VARIOUS KINDS OF TEST SAMPLES. FT-IR MEASUREMENTS WILL BE MADE OF THE TEMPERATURES OF GASES AND THE TEST SAMPLE SURFACE DURING THE EXPERIMENTS TO ASSESS MAXIMUM TEMPERATURES, TEMPERATURES UNIFORMITY, AND HEAT TRANSFER PROCESSES....THE RESULTS WILL BE EMPLOYED TO DEFINE THE BEST CONDITIONS AND MAKE A PRELIMINARY DESIGN FOR A PROTOTYPE SYSTEM.

MALIBU RESEARCH ASSOCS
26670 AGOURA RD
CALABASAS, CA 91302
Program Manager: DR GERALD E POLLON
Contract #:
Title: LOW COST PIEZO-ELECTRONIC PHASED-ARRAY ANTENNA
Topic #: A90-370 Office: MTL ID #: 42152

THE DESIRE FOR A LOW-COT PHASED-ARRAY HAS BEEN THE FOCUS OF ANTENNA TECHNOLOGY FOR AS LONG AS THESE SYSTEMS HAVE BEEN USED. FOR A WHILE MMIC TECHNOLOGY SEEMED TO OFFER A SOLUTION, BUT DESPITE SEVERAL YEARS OF ENDEAVOR LOW COST, WITH REASONABLE PERFORMANCE, IF NOT WITHIN SIGHT. MALIBU RESEARCH BELIEVES A DRAMATICALLY DIFFERENT MATERIAL APPROACH IS CALLED FOR. RECENTLY MALIBU RESEARCH HAS DEVELOPED A PHASED-SURFACE TECHNOLOGY FOR CONSTRUCTION OF THIN, LOW COST ELECTROMAGNETIC STRUCTURES HAVING THE CAPABILITY OF STEERING INCIDENT RF IN ARRAYS OF PRINTED CIRCUIT DIPOLES ON A THIN DIELECTRIC SUBSTRATE. WE HAVE USED THIS METHOD SUCCESSFULLY TO IMPLEMENT ANTENNA AND CONTROLLED SCATTERING SURFACES OF C-BAND, Ku-BAND, Ka-BAND AND W-BAND, AS DESCRIBED IN OUR PROPOSAL. IN THE PRESENT DESIGNS THE BEAM IS NOT STEERED, HOWEVER AS IS SHOWN HEREIN, IF A PIEZOELECTRIC MATERIAL IS USED AS THE SUBSTRATE THEN VOLTAGE MODULATION OF THIS WILL RESULT IN AN ELECTRONICALLY STEERABLE BEAM. FURTHERMORE THE NATURE OF THE REFLECTIVE SURFACE OPERATION IN INHERENTLY LEADS TO LOW LOSSES AND THE POTENTIAL FOR VERY LOW MANUFACTURING COST. THE PROPOSED SBIR PROJECT WILL ESTABLISH THE FEASIBILITY OF THIS PIEZO-ELECTRONIC SCAN ANTENNA CONCEPT BY MEANS OF RESEARCH, ANALYSIS, SIMULATION AND ANTENNA DESIGN.

INDUSTRIAL QUALITY INC
PO BOX 2519 - 19634 CLUB HOUSE RD
GAITHERSBURG, MD 20879
Program Manager: THOMAS JONES
Contract #:
Title: PORTABLE THERMOGRAPHIC INSPECTION FOR COMPOSITES
Topic #: A90-371 Office: MTL ID #: 42153

INFRARED THERMAL IMAGING COMBINED WITH ADVANCED IMAGE PROCESSING TECHNIQUES AND DESIGN FOR PORTABILITY IS PROPOSED AS A METHOD FOR ENHANCING THE DETECTION OF CRITICAL DEFECTS IN COMPOSITE STRUCTURES. IT IS BELIEVED THAT THE INCORPORATION OF ADVANCED IMAGE PROCESSING TECHNIQUES CAN SUBSTANTIALLY EXTEND THE SENSITIVITY RRANGE. THE INFRARED IMAGING APPROACH OFFERS THE ADVANTAGES OF PROVIDING A PORTABLE, NON-CONTACT INSPECTION SYSTEM AND PROVIDES RAPID INSPECTION OF RELATIVELY LARGE AREAS. DATA IS COLLECTED ON VIDEOTAPE AND CAN BE

VIEWED IN REAL TIME FOR MORE SEVERE DEFECT CONDITIONS. POST INSPECTION ANALYSIS OF THE DATA AT AN IMAGE ENHANCEMENT WORKSTATION CAN INCREASE THE SENTISITIVITY FOR THE DETECTION OF LESS SEVERE DEFECT CONDITIONS. THE PHASE I RESULTS WILL ESTABLISH THE FEASIBILITY OF USING THE PORTABLE DESIGN AND THE ADVANCED IMAGE PROCESSING APPROACHES TO EXTEND THE SENSITIVITY AND WILL DETERMINE HEAT EXCITATION TECHNIQUES AND KEY IMAGE PROCESSING STEPS WHICH ARE MOST EFFECTIVE. THE PHASE II PROGRAM WILL FURTHER REFINE THE DESIGN CONCEPTS AND THE IMAGE PROCESSING TO OPTIMIZE SENSITIVITY FOR VARIOUS TYPES OF DISCONTINUITIES AND WILL ESTABLISH RULES FOR INTERPRETATION OF THE ENHANCED INFRARED IMAGES. A PROTOTYPE PORTABLE INSPECTION SYSTEM WILL BE DEVELOPED UNDER THE PHASE II PROGRAM.

MATERIALS & ELECTROCHEMICAL RSCH CORP
7960 S KOLB RD
TUCSON, AZ 85706
Program Manager: LORI A LEASKEY
Contract #:
Title: CONTROLLED MICROSTRUCTURAL DEVELOPMENT OF Si(3)N(4) TO ENHANCE FRACTURE TOUGHNESS
Topic #: A90-373 Office: MTL ID #: 42154

SILICON NITRIDE IS AN ADVANCED CERAMIC MATERIAL WITH EXCEPTIONAL PROPERTIES. HOWEVER, A SEVERE PROPERTY LIMITATION IS OBSERVED IN THE LOW FRACTURE TOUGHNESS OF Si(3)N(4). THE POTENTIAL FOR UTILIZATION OF Si(3)N(4) CERAMICS IN MANY APPLICATIONS WOULD BE SIGNIFICANTLY IMPROVED IF ITS FRACTURE TOUGHNESS COULD BE INCREASED WITHOUT SACRIFICING HIGH TEMPERATURE STRENGTH. IT IS PROPOSED THAT THE ABOVE CAN BE ACCOMPLISHED THROUGH MANIPULATION OF THE MICRO- STRUCTURE OF Si(3)N(4) TO PRODUCE A MIXTURE OF ACICULAR AND EQUIAXED GRAINS. THIS CAN BE ACHIEVED BY NANOCOATING INDIVIDUAL Si(3)N(4) PARTICLES WITH RARE EARTH OXIDES (Y(2)O(3), Nd(2)O(3), Al(2)O(3) OR SOME COMBINATION). CONTROL OF THE AMOUNT AND TYPE OF COATING, AND RATIO OF COATED TO UNCOATED PARTICLES WILL ALLOW CONTROL OF THE RESULTING Si(3)N(4) MICROSTRUCTURE TO EFFECT THE DESIRABLE PROPERTIES. ALSO, THE UNIFORM DISTRIBUTION OF THE COATING IN A CONTROLLED AMOUNT TO LIMIT GLASSY PHASE FORMATION WILL RESULT IN A HOMOGENEOUS COMPOSITE WITH DECREASED PORTABILITY FOR HIGH TEMPERATURE DEGRADATION.

MATERIALS & ELECTROCHEMICAL RSCH CORP
7960 KOLB RD
TUCSON, AZ 95706
Program Manager: DR J C WITHERS
Contract #:
Title: DEVELOPMENT OF PLASMA SYNTHESIS TO PRODUCE PRE-ALLOYED ULTRAFINE INTERMETALLIC ALUMINIDE POWDERS FOR INJECTION MOLDING
Topic #: A90-374 Office: MTL ID #: 42155

INTERMETALLIC ALUMINIDES OFFER SIGNIFICANT PROMISE BECAUSE OF THEIR STRENGTH AND MODULUS RETENTION WITH TEMPERATURE, OXIDATION RESISTANCE AND LIGHTWEIGHT. IF INTERMETALLIC ALUMINIDES COULD BE INJECTION MOLDED THEIR USE WOULD BE FURTHER EXPANDED. PRESENT POWDER PRODUCTION DOES NOT PRODUCE ACCEPTABLE POWDER FOR INJECTION MOLDING. INJECTION MOLDING REQUIRES SPHERICAL, UNIFORM POWDER SIZES <20u DIAMETER. IN CURSORY RESEARCH IT HAS BEEN DEMONSTRATED A PLASMA SYNTHESIS USING CHEMICAL PRECURSORS AND A PLASMA INITIATED SOLID STATE REACTION PRODUCED SPHERICAL ULTRAFINE TITANIUM AND NICKEL ALUMINIDE PARTICLES. THESE PROCESSE WILL BE FURTHER INVESTIGATED TO PRODUCE PRE-ALLOYED ULTRAFINE INTERMETALLIC PARTICLES AND UTILIZED FOR INJECTION MOLDING EVALUATION. COMPARATIVE TECHNICAL AND ECONOMIC ANALYSIS WILL BE PERFORMED FOR SELECTING ONE PROCESS FOR SCALE-UP IN PHASE II.

THE ANALYTIX GP
PO BOX 502482
HOUSTON, TX 77250
Program Manager: FRANCIS D GUTOWSKI
Contract #:
Title: INNOVATIVE LIFE CYCLE MANAGEMENT SYSTEM FOR COMPOSITES
Topic #: A90-375 Office: MTL ID #: 42156

STRUCTURAL COMPOSITES FABRICATION IS CHARACTERIZED BY A VARIETY OF REACTIVE MATERIALS HAVING LIMITED SHELF LIVES. THE INTEGRITY OF A COMPOSITE STRUCTURE DEPENDS ON THE INTEGRITY OF MATERIALS AND PROCESSES USE TO PRODUCE IT. HENCE, MATERIAL IDENTITIES MUST BE ACCURATELY DOCUMENTED. BAR CODE SCANNING CAN FACILITATE DATA COLLECTION, REDUCE DATA-ENTRY ERRORS, ALLEVIATE THE BURDEN OF MANAGING QUALITY ASSURANCE DOCUMENTATION AND POTENTIALLY AVERT THE MISAPPLICATION OF MATERIALS. A SIGNIFICANT TECHNICAL CHALLENGE EXISTS IN DESIGNING AND IMPLEMENTATING AN INTERACTIVE BAR CODE DATA- BASE SYSTEM FOR COMPOSITES LIFE-CYCLE MANAGEMENT WHICH USERS CAN EASILY ADAPT TO ANY COMPOSITES FABRICATION ENVIRONMENTAL AND DATA- GATHERING REQUIREMENT. THE PRINCIPAL TECHNICAL OBJECTIVE OF THIS PROPOSAL IS TO DELIVER, THROUGH THE APPLICATION OF AN OBJECT-ORIENTED PROGRAMMING LANGUAGE, INTERFACE AND METHODOLOGY, A WORKING PROTO- TYPED. AT FIRST, THE PROTOTYPE WIL'. DEMONSTRATE BASIC USER INTERFACE AND MATERIAL TRACKING FUNCTIONS. THE INTERFACE AND FUNCTIONALITY WILL BE ENHANCED TO GAUGE THE EXTENT OF MATERIAL AND PROCESS COMPLEXITY THE SYSTEM WILL NEED TO INCORPORATE IN PHASE II. THE WORKING PROTOTYPE DELIVERED AT THE CONCLUSION OF PHASE I WILL 1) ESTABLISH THE VIABILITY OF THE PROPOSED SOFTWARE DEVELOPMENT CONCEPTS, AND 2) DEFINE PHASE II TECHNICAL REQUIREMENTS FOR EVOLUTIONARY REFINEMENT AND IMPLEMENTATION.

MISSION RESEARCH CORP
8560 CINDERBED RD - STE 700
NEWINGTON, VA 22122
Program Manager: RICHARD SMITH
Contract #:
Title: DIAGNOSTIC TOOL FOR HIGH-POWER MICROWAVE (HPM) CHARACTERIZATION
Topic #: A90-376 Office: VAL ID #: 42158

WE PROPOSE PHASE I OF AN EFFORT WHICH WILL RESULT IN A NON-PERTURBING RF ELECTRIC FIELD PROBE CAPABLE OF COVERING THE POWER INTENSITY RANGE OF 10 TO 1000 W/cm(2), AT FREQUENCIES BETWEEN 100 MHz AND 10 GHz, WITH SUFFICIENT BANDWIDTH AND LINEARITY TO MEASURE HPM PULE SHAPES. OUR APPROACH WILL BE TO USE SUB-MILLIMETER ELECTRO-OPTIC SENSORS, SENDING OPTICAL SIGNALS TO AN ULTRA-SENSITIVE REMOTE DETECTION SYSTEM VIA SUB-MILLIMETER, SINGLE-MODE FIBER OPTIC CABLES. WE SHOW THAT THE HIGH DIELECTRIC CONSTANT OF MOST ELECTRO-OPTIC CRYSTALS GREATLY REDUCES THE ELECTRIC FIELD IN THE CRYSTAL, CAUSES IT TO SCATTER MICROWAVE RADIATION, AND COMPLICATES CALIBRATION, THUS PLACING A PREMIUM ON SENSITIVITY, MINIATURIZATION, AND GEOMETRICAL SIMPLICITY. WE PRESENT SEVERAL ALTERNATIVE AND COMPLEMENTARY INNOVATIVE DESIGN CONCEPTS FOR BOTH THE OPTICAL SENSING ELEMENT AND THE DETECTION SYSTEM. THESE RANGE FROM NOVEL DETECTION OF SIGNALS TRANSDUCED BY MINIATURE CONVENTIONAL ELECTRO-OPTIC CRYSTALS TO SYSTEMS BASED UPON MORE EXOTIC MULTIPLE QUANTIUM WELL (MQW) STRUCTURES. THROUGH MATHEMATICAL ANALYSIS, COMPUTATIONAL WORK, AND EXPERIMENTAL TESTING, WE PROPOSE TO PREDICT ACCURATELY THE BEHAVIOR OF EACH PROBE COMPONENT AS WELL AS THE COMPLETED PROBE AND TO DEMONSTRATE PROOF-OF-PRINCIPLE OF KEY PROBE FUNCTIONS.

TACAN CORP
2330 FARADAY AVE

CALSBAD, CA 92008
Program Manager: DR ARTHUR NELSON
Contract #:
Title: DIAGNOSTIC TOOL FOR HIGH POWER MICROWAVE (HPM)
Topic #: A90-376 Office: VAL ID #: 42157

THE ACCURATE MEASUREMENT OF ELECTRIC FIELD PULSE SHAPE AND INTENSITY IS OFTEN DIFFICULT DUE TO THE PERTURBING EFFECT OF THE MEASUREMENT ANTENNA ITSELF AND THE ASSOCIATED CABLE. PREVIOUS ATTEMPTS TO MINIMIZE THESE EFFECTS HAVE RESULTED IN THE DEVELOPMENT OF ELECTRO-MAGNETIC PROBES USING METALLIC ANTENNAS THAT DO NOT DIRECTLY REVEAL PULSE OR CW SIGNAL SHAPE, BUT RATHER TRANSMIT A DC REPRESENTATION OF SIGNAL STRENGTH. OTHER APPROACHES USING FIBER OPTICS HAVE NOT ELIMINATED METAL COMPONENTS AND HAVE LACKED ADEQUATE BANDWIDTH. HOWEVER, NEW DEVELOPMENTS IN LASERS AND FIBER OPTICS HAVE MADE POSSIBLE THE DESIGN OF ALL OPTICAL APPROACHES TO ELECTROMAGNETIC FIELD MEASUREMENT THAT PROMISE GREATLY IMPROVED ACCURACY BY ELIMINATING ALL METAL FROM THE FIELD SENSOR AND THE ASSOCIATED CABLES. A NEW MODULATOR DESIGN USING SINGLE MODE OPTICAL FIBERS AND A MINIATURE LiTaO(3) CRYSTAL IS CAPABLE OF SENSING HIGH POWER MICROWAVE (HPM) PULSE WITH POWER LEVELS BETWEEN 10 AND 1000 W/cm(2) FOR FREQUENCIES UP TO AT LEAST 10 GHz. IN ADDITION, THE FIBER OPTIC APPROACH PROVIDES FOR THE TRANSMISSION OF THE ACTUAL SIGNAL TO REMOTE ELECTRONICS FOR ANALYSIS AND MEASUREMENT. THUS PULSE SHAPE AND OTHER PARAMETERS CAN BE ANALYZED IN DETAIL.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
Program Manager: M C LEE
Contract #:
Title: ULTRA-VIOLET DYNAMIC SCENE GENERATOR
Topic #: A90-378 Office: VAL ID #: 42159

WE PROPOSE THE DEVELOPMENT OF A PROGRAMMABLE ULTRA-VIOLET (UV) DYNAMIC SCENE GENERATOR (UVDSG) TAILORED TO PERFORM HARDWARE-IN- THE-LOOP (HIL) SIMULATION OF UV SENSORS USED IN MILITARY SYSTEMS. WE WILL INVESTIGATE A SPECIAL PROCESS FOR FABRICATING A 2-DIMENSIONAL ARRAY OF MICROSCOPIC, DEFORMABLE MIRRORS ON A SILICON WAFER, DESIGN AN ON-CHIP CIRCUIT FOR CONTROLLING THE MIRROR DEFORMATION AND DESIGN A CONTROL PROCESSOR FOR OPERATING THE ARRAY. EACH MIRROR WILL BE INDEPENDENTLY DEFORMED TO ANY DESIRED ANGLE WITHIN ITS DEFORMATION RANGE BY A PROGRAMMABLE ELECTRICAL VOLTAGE. THUS, THE MIRRORS WILL BE MADE TO REFLECT AN UV BEAM IN A CONTROLLED MANNER. WHEN THE MIRRORS OF THE ARRAY ARE MADE TO REFLECT INDEPENDENTLY, A 2-DIMENSIONAL UV SCENE WILL BE PROJECTED WHEN A COLLIMATED UV BEAM IS INCIDENT ON THE ARRAY. THIS SCENE WILL THEN BE PROJECTED ONTO THE SENSOR UNDER TEST OR SUBJECTED TO HIL SIMULATION. DUE TO ITS HIGH FRAME RATE, THE ARRAY WILL BE IDEAL FOR PROJECTING FAST-CHANGING SCENES ONTO THE SENSOR SYSTEM TO SIMULATE THE UV DYNAMICS EXPERIENCED BY THE SENSOR.

LJF CORP
411 S LONDON AVE
EGG HARBOR CITY, NJ 08215
Program Manager: JAMES L FOY
Contract #:
Title: DYNAMIC SCENE GENERATOR
Topic #: A90-378 Office: VAL ID #: 42160

AN EXTENSION OF THE LJF INFRA-RED CATHODE-RAY-TUBE WILL ALLOW IT TO ACHIEVE HIGH FRAME

RATES, WITH FEWER ARTIFACTS AND WITH FAR HIGHER POWER. IT WILL HAVE HIGHER THAN 512 PIXEL X 512 PIXEL RESOLUTION, WILL OPERATE IN BOTH THE 3-5 AND IN THE 8-12 MICRON BANDS, AND A DYNAMIC RANGE GREATER THAN 20dB. IT WILL OPERATE AT FRAME RATES GREATER THAN 100 PER SECOND. IT WILL ACCEPT EITHER AN 8-BIT DIGITAL INPUT OR AN ANALOG VIDEO INPUT WITH SUITABLE SYNC. IT WILL HAVE A TEMPERATURE RESOLUTION NOT GREATER THAN 0.1 C. WE WILL ALSO PRESENT AN INVESTIGATION OF AN IMAGE PROJECTOR WITH A VARIABLE FIELF OF VIEW FROM 3 TO 20 DEGREES IN 1 DEGREE INCREMENTS WITH CAPABILITY TO PROJECT AN IMAGE IN THE IR, UV (0.2 TO 0.4 MICRON) AND THE MMW (35 GIGAHERTZ 1/2 GHZ) BANDS.

XMCO INC
460 SPRING PARK PL - TE 1500
HERNDON, VA 22070
Program Manager: JOHN E RITCHIE JR
Contract #:
Title: SYSTEM ACQUISITION AND MAINTENANCE PROCEDURE GUIDELINE DEVELOPMENT FOR CM/BDR AVIONICS IN ARMY HELICOPTERS--PROBLEM DEFINITION
Topic #: A90-379 Office: AVSCOM ID #: 42161

XMCO INC. WITH THE SUPPORT OF THE RAIL COMPANY PROPOSES A PHASE I EXPLORATORY DEVELOPMENT PROBLEM DEFINITION STUDY TO THE AVIATION SYSTEM COMMAND (AVSCOM) FOR THE DEVELOPMENT OF COMBAT MAINTENANCE/ BATTLE DAMAGE REPAIR (CM/BDR) GUIDELINES/SPECIFICATIONS FOR AVIONICS IN ARMY HELICOPTERS. THE PROPOSED EFFORT ADDRESSES: (1) PROCEDURES/ SPECIFICATIONS TO AVOID THE NEED FOR CM/BDR AS WELL AS TO PROMOTE SUPPORTABILITY OF CM/BDR MAINTENANCE PROCEDURES THROUGH INFLUENCE OF THE HELICOPTER AND AVIONICS ACQUISITION PROCESSES; AND (2) PROCEDURES TO CORRECT CM/BDR DEFICIENCES IN EXISTING AVIONIC COMPONENTS. PROBLEM DEFINITION IS APPROACHED THROUGH SIX TASKS THAT WILL: (1) REFINE CM/BDR GUIDELINE DEVELOPMENT INTERFACES AND FUNCTIONAL REQUIREMENTS; (20 INVESTIGATE CM/BDR THREAT SEVERITY AND VULNERABILITY ASSESSMENT METHODOLOGIES; (3) IDENTIFY AND EVALUATE ACQUISITION PROCESS OPPORTUNITIES TO REDUCE CM/BDR IMPACT ON OPERATIONAL AVAILABILITY; (4) REVIEW DESIGN, SUPPORTABILITY, LOGISTIC ASSETS, AND MAINTENANCE DATA FOR EXISTING AVIONIC COMPONENTS; (5) SCOPE AND OUTLINE GUIDELINES RECOMMENDED FOR DEVELOPMENT; AND (6) PROVIDE A BRIEFING AND FINAL REPORT. PHASE I RESULTS WILL PROVIDE A CM/BDR PROBLEM DEFINITION TOGETHER WITH SCOPE AND OUTLINE OF CM/BDR GUIDELINES RECOMMENDED FOR DEVELOPMENT. SUCCESSFUL COMPLETION OF PHASE I WILL RESULT IN A PROPOSAL FOR DEVELOPING IN PHASE II THE RECOMMENDED GUIDELINES AS APPROVED BY AVSCOM.

TAU CORP
485 ALBERTO WY
LOS GATOS, CA 95032
Program Manager: STEVE BIER
Contract #:
Title: SPATIAL AND TEMPORAL REGISTRATION OF DISSIMILAR SENSORS
Topic #: A90-380 Office: AVSCOM ID #: 42162

THE FOCUS OF THIS PROJECT WILL BE TO DEFINE AN INNOVATIVE APPROACH FOR ASSOCIATING TARGET REPORTS FROM DISSIMILAR SENSORS INCLUDING FORWARD LOOKING INFRARED (FLIR), TV AND MILLIMETER WAVE (MMW) RADAR. THIS APPROACH INCLUDES CORRECTIONS FOR SENSOR MISALIGNMENTS, FILTERING OF SENSOR MEASUREMENTS FOR IMPROVED ACCURACIES, AND EMPLOYMENT OF A DIGITAL TERRAIN DATABASE (DTD) FOR THE ESTIMATION OF MISSION SENSOR MEASUREMENT PARAMETERS. THE PROPOSED EFFORT WILL ALSO EXAMINE THE PROPER CHOICE OF THE COORDINATE FRAME USED TO PERFORM THE ASSOCIATION PROCESS, THE PROPAGATION OF TARGET REPORTS TO A COMMON TIME REFERENCE, THE ESTIMATION OF SENSOR MISALIGNMENTS, AND THE SENSOR MEASUREMENT AND DIGITAL TERRAIN DATABASE ACCURACIES REQUIRED FOR ADEQUATE CORRELATION

PERFORMANCE.

PDI CORP
2200 SOMERVILLE RD
ANNAPOLIS, MD 21401
Program Manager: LARRY C CARROLL
Contract #:
Title: TUBROSHAFT ENGINE SURGE CONTROL
Topic #: A90-381 Office: AVSCOM ID #: 42163

THE SUBJECT OF THIS SBIR PROPOSAL IS THE DETECTION AND CONTROL OR ELIMINATION OF COMPRESSOR STALL/SURGE IN U.S. ARMY HELICOPTER GAS TURBINE ENGINES. STAFF OR SURGE CAN LEAD TO POWER LAPSES AND POTENTIALLY DESTRUCTIVE STRUCTURAL LOADS. RECENT R&D IN VARIOUS CENTERS SHOWS PROMISE FOR ACTIVE COMPRESSOR CONTROL. SUCH CONTROL WOULD EXTEND OPERATION INTO THE PREVIOUSLY FORBIDDEN SURGE REGION. THIS WOULD IMPROVE ENGINE EFFICIENCY WHILE ELIMINATING OR MITIGATING STALLS AND SURGES IN COMPRESSORS. ACTIVE COMPRESSOR CONTROL CAN BE ACHIEVED BY A DIGITAL FEEDBACK CONTROL LOOP SENSING STALL INCEPTION VIA PRESSURE TRANSDUCERS, AND USE OF ENGINE VARIABLE GEOMETRY, BLEED, OR FUEL MODULATION OT STABILIZE COMPRESSOR AERODYNAMIC FLOW. SUCH A LOOP REQUIRES DETAILED MODELING OF THE COMPRESSOR STALL AND ACTUATOR CONTROL MECHANISMS. THIS PHASE I PROPOSAL USES NEW THEORETICAL AND EXPERIMENTAL RESULTS TO DEVELOP A SYSTEMS APPROACH AND PRELIMINARY DESIGN OF A SURGE CONTROL LOOP FOR A HELICOPTER GAS TURBINE ENGINE. ALSO, A TRADEOFF ANALYSIS INVOLVING SURGE PROTECTION AND ENGINE BENEFITS IS DEVELOPED. THIS PHASE I STUDY HAS THE ULTIMATE GOAL OF DESIGN AND TEST OF STALL CONTROL LOOP HARDWARE IN PHASE II FOR A DESIGNATED ENGINE.

ISX CORP
501 MARIN ST - STE 214
THOUSAND OAKS, CA 91360
Program Manager: CARL FRIEDLANDER
Contract #:
Title: AN ASSOCIATE SYSTEMS TOOLKIT FOR DEVELOPMENT OF THE ROTOCRAFT SYSTEM STATUS KNOWLEDGE
Topic #: A90-382 Office: AVSCOM ID #: 42164

THIS PROPOSED EFFORT IS DIRECTED TOWARD THE DESIGN AND DEVELOPMENT OF AN INTELLIGENT INTEGRATED SOFTWARE ENVIRONMENT SUPPORTING THE DESIGN, DEVELOPMENT, EXECUTION, AND LIFE CYCLE MAINTENANCE OF REAL- TIME ASSOCIATE SYSTEMS IN GENERAL AND THE D/NAPS SYSTEM STATUS COMPONENT IN PARTICULAR. ASSOCIATE SYSTEMS ARE DEFINED AS SOFTWARE SYSTEMS THAT BLEND THE TECHNOLOGIES OF KNOWLEDGE BASE SYSTEM CONVENTIONAL SOFTWARE TECHNOLOGY, AND ADVANCED MAN-MACHINE INTERFACE CONCEPTS TO FACILITATE SYMBIOTIC, MIXED-INITIATIVE RELATIONSHIP BETWEEN FUNCTIONAL SYSTEMS AND THEIR OPERATORS. PHASE I OF THIS PROGRAM WILL INCLUDE THE DEVELOPMENT OF A PROOF-OF-CONCEPT DEMONSTRATION FOR THE KNOWLEDGE CAPTURE SYSTEM, VALIDATION OF THE APPROACH WHICH IS BASED ON LEVERAGING EXISTING SOFTWARE COMPONENTS AND METHODOLOGIES DEVELOPED IN THE LOCKHEED PILOT'S ASSOCIATE PROGRAM AND OTHER RELATED PROJECTS. IN ADDITION TO THE PROTOTYPE KNOWLEDGE BASE CONSTRUCTION TOOL, WE WILL DELIVER A FULLY SPECIFICED INTERFACE DEFINITION FOR THE INTEGRATION OF THE CONSTRUCTED KNOWLEDGE BASE WITH THE D/NAPS CONTROL SYSTEM AS WELL AS TEST AND EVALUATION PROCEDURES AND EVALUATION OF THE PHASE II PRODUCT. THE FOCUS OF THE PHASE II PROGRAM WILL BE EXTENSION AND ENHACNEMENT OF THE CORE CAPABILITIES PRODUCED DURING PHASE I AND TO DELIVERY OF A FUNCTIONAL KNOWLEDGE BASE TO THE D/NAPS SYSTEM.

SAT-CON TECHNOLOGY CORP
12 EMILY ST
CAMBRIDGE, MA 02139
Program Manager: JAMES DOWNER
Contract #:
Title: A MAGNETIC BEARING SYSTEM FOR GAS TURBINE ENGINES
Topic #: A90-383 Office: AVSCOM ID #: 42356

MECHANICAL BEARINGS REQUIRE LUBRICANT, PRODUCE FRICTIONAL HEAT, RESIST STARTING, HAVE SURFACE CHEMISTRY PROBLEMS, AND REQUIRE SUBSTANTIAL SUPPORT EQUIPMENT FOR COOLING AND LUBRICANT DELIVERY. DESIGNING BEARINGS FOR EXTENDED OPERATION IN A HIGH-TEMPERATURE ENVIRONMENT IS, AT BEST, DIFFICULT. MAGNETIC BEARINGS HAVE BEEN IDENTIFIED BY THE US ARMY AS AN ENABLING TECHNOLOGY FOR OPERATION OF FUTURE TWO-SPOOL GAS TURBINE ENGINES. MAGNETIC BEARINGS PROVIDE CONTACT-FREE ROTOR SUPPORT USING SERVO-CONTROLLED MAGNETIC FILEDS IN ORDER TO AVOID FRICTIONAL EFFECTS AND ALLOW A SUBSTANTIALLY REDUCTION IN SUPPORT EQUIPMENT. ADVANCEMENTS IN THE CURRENT STATE OF MAGNETIC BEARING TECHNOLOGY ARE REQUIRED DUE TO THE HIGH TEMPERATURE ENVIRONMENT AND THE COMPLEX DYNAMICS OF THE TWO SPOOL SYSTEM. SATCON TECHNOLOGY CORP PROPOSES TO DEVELOP AN INTEGRATED MAGNETIC BEARING SYSTEM AS THE ONLY VIABLE ALTERNATIVE TO MECHANICAL BEARINGS IN FUTURE TWO- SPOOL GAS TURBINE ENGINES. SATCON TAKES AN OVERALL SYSTEMS APPROACH TO MAGNETIC BEARING SYSTEM DESIGN. KEY COMPONENTS ARE SELECTED FOR OPTIMUM INTEGRATED SYSTEM PERFORMANCE. SATCON HAS OVER 40 RELATED CONTRACTS AND A PROVEN TRACK RECORD IN APPLYING MAGNETIC BEARING SYSTEM TECHNOLOGY. PROFESSOR DAVID G WILSON OF M.I.T. WILL ACT AS A CONSULTANT TO SATCON ON THE DESIGN AND CONSTRUCTION OF GAS TURBINE ENGINES. HIS HANDS-ON EXPERIENCE WITH GAS TURBINES WILL AUGMENT SATCON'S ACCUMULATED EXPERTISE IN MAGNETIC BEARING SYSTEM DESIGN.

PRECISION COMBUSTION INC
25 SCIENCE PK
NEW HAVEN, CT 06511
Program Manager: DR WILLIAM C PFEFFERLE
Contract #:
Title: HIGH EFFICIENCY LONG LIFE CATALYTIC OXIDATION SYSTEM
Topic #: A90-385 Office: AVSCOM ID #: 42166

PRECISION COMBUSTION IS DEVELOPING HIGHLY COMPACT AND MORE EFFECTIVE CATALYTIC METAL MONOLITH AND CATALYTIC INCINERATION TECHNOLOGY. AN EPA SBIR PHASE I PROJECT (COMPLETED 4/90) DEMONSTRATED VERY HIGH CATALYTIC CONVERSION OF EXHAUST GASES, WITH LOW AMOUNTS OF ELECTRIC HEATING CAPABLE OF PROVIDING RAPID INITIAL HEAT-UP AS WELL AS SUPPLEMENTARY HEAT ADDITION WHEN NEEDED (PHASE II PROPOSAL PENDING). A TACOM SBIR PHASE I PROJECT USED A SIMILAR PROTOTYPE FOR DIESEL IGNITION, SHOWING RAPID IGNITION OF VERY COLD FLOWING FUEL/AIR MIXTURES USING LOW LEVELS OF ELECTRIC POWER (PHASE II PROJECT TO START 9/90). AT HIGHER TEMPERATURE, AN NSF SBIR PHASE I DEMONSTRATED VERY HIGH DESTRUCTION (BEYOND DETECTOR LIMITS) IN CATALYTIC INCINERATION OF METHYL CHLORIDE IN ETHANE; MODELING ESTIMATED ACTUAL DESTRUCTION OF AT EIGHT TO FIFTEEN NINES (PHASE II PROJECT TO START FALL 1990). WE PROPOSE ADAPTING THESE TECHNOLOGIES TO PROVIDE A SUPERIOR, HIGHLY COMPACT AND DURABLE CATALYTIC CONVERTER FOR MEETING ARMY HELICOPTER BIOLOGICAL AND CHEMICAL PROTECTION OBJECTIES. IN PHASE I, WE WILL BUILD A PROTOTYPE, OPERATE WITH A SIMULANT, AND CHARACTERIZE THE SYSTEM. DEMONSTRATING HIGH DESTRUCTION EFFECTIVENESS AND EXPLORING TRADE-OFFS WHILE PROVIDING A PRELIMINARY SYSTEMS DESIGN FOR PHASE II.

PACIFIC-SIERRA RESEARCH CORP
1401 WILSON BLVD - STE 1100

ARLINGTON, VA 22209
Program Manager: KATHLEEN HARKIN
Contract #:
Title: DIGITAL TERRAIN DATABASE RESOLUTION AND ACCURACY ANALYSIS
Topic #: A90-386 Office: AVSCOM ID #: 42358

THE DEFENSE MAPPING AGENCY (DMA) HAS SEVERAL EXISTING AND PROTOTYPE DIGITAL DATA PRODUCTS WHICH HAVE DIFFERING RESOLUTIONS AND ACCURACIES THAT CAN OFFER INCREASED MISSION PLANNING, TARGET ACQUISITION AND NAVIGATION CAPABILITY. THE PROCESS OF GENERATING DIGITAL PRODUCTS WITH HIGH RESOLUTION AND ACCURACY IS SLOW AND EXTREMELY LABOR INTENSIVE. HIGH RESOLUTION PRODUCTS WILL INCREASE DATA STORAE AND COMPUTATIONAL REQUIREMENTS. THE NET INCREASE IN MISSION CAPABILITY MUST BE EVALUATED IN TERMS OF A TRADE OFF BETWEEN HIGH RESOLUTION AND ACCURACY AND OTHER ALTERNATIVES. THE SURVIVABILITY OF SCOUT AND ATTACK HELICOPTERS IN MANY SCENARIOS DEPENDS ON AN ACCURATE PREDICTION OF THE REQUIRED POP UP HEIGHT AND TARGET LOCATION TO MINIMIZE EXPOSURE TIME. PSR WILL DEVELOP A COMPUTER MODEL TO DETERMINE THE EFFECTS OF ACCURACY OF A DIGITAL TERRAIN DATABASE (DTD) ON LINE-OF-SIGHT (LOS) COVERAGE PREDICTION CAPABILITY. PSR WILL PERFORM SENSITIVITY ANALYST USING DTDS HAVING VARIOUS ACCURACIES AND USING A SERIES OF PLATFORM ALTITUDES AND PLATFORM-TO-TARGET RANGES. THE RESULTS WILL BE COMBINED TO MAKE A DETERMINATION OF THE BENEFIT OF EACH PRODUCT EXAMINED AND DEVELOP RECOMMENDATIONS FOR MODEL IMPROVEMENTS AND ADDITIONS. PSR WILL SUMMARIZE THE EFFORT IN FINAL REPORT.

FATIGUE TECHNOLOGY INC
150 ANDOVER PARK W
SEATTLE, WA 98188
Program Manager: ERIC T EASTERBROOK
Contract #:
Title: ADVANCED FASTENER SYSTEM FOR COMPOSITE STRUCTURES
Topic #: A90-387 Office: AVSCOM ID #: 42168

A RESEARCH PROGRAM WILL BE PERFORMED TO PRODUCE A MORE COMPLETE UNDERSTANDING OF FASTENING SYSTEMS FOR ADVANCED COMPOSITES. THIS WILL INCLUDE EVALUATIONS OF CURRENT PRODUCTION FASTENER SYSTEMS AS WELL AS A CANDIDATE SYSTEM BASED ON THE USE OF A COLD EXPANSION PROCESS TO PERMANENTLY INSTALL THIN WALL PROTECTIVE GROMMETS IN FASTENER HOLES IN COMPOSITIES. THESE FASTENER SYSTEMS WILL BE TESTED FOR INTERFACE REQUIREMENTS WITH ADVANCED COMPOSITE MATERIALS. THIS PROGRAM WILL DETERMINE THE POTENTIAL FOR USING THE COLD EXPANSION GROMMET INSTALLATION SYSTEM AS THE FOUNDATION OF A FASTENER SYSTEM THAT WILL PERMIT THE USE OF STANDARD AEROSPCE FASTENERS IN COMPOSITE JOINING APPLICATIONS.

CFD RESEARCH CORP
3325-D TRIANA BLVD
HUNTSVILLE, AL 35805
Program Manager: CLIFFORD E SMITH
Contract #:
Title: DUAL AIRBLAST FUEL INJECTOR FOR SMALL GAS TURBINE ENGINES
Topic #: A90-388 Office: AVSCOM ID #: 42169

AN ADVANCED FUEL INJECTOR WITH IMPROVED ATOMIZATION AND MIXING CHARACTERISTICS IS NEEDED FOR CURRENT AND ADVANCED SMALL GAS TURBINE ENGINES. IN ADDITION, DUE TO HIGHER COMBUSTOR TEMPERATURE RISE AND HEAT SINK DEMANDS, THE ADVANCED INJECTOR MUST BE CAPABLE OF OPERATING AT HIGHER FUEL TEMPERATURES WITHIN PLUGGING. THIS PROJECT PROPOSES TO DEVELOP AN ADVANCED DUAL AIRBLAST INJECTOR BY: 1) FULLY INTEGRATING THE COMBUSTOR DOME SWIRLER

AND TWO AIRBLAST AROMIZERS (PRIMARY AND SECONDARY) INTO A SINGLE FUNCTIONAL UNIT:; 2) MAINTAINING MINIMUM FUEL FLOW PASSAGES GREATER THAN 0.018 INCH; AND 3) OPTIMIZING THE SPRAY DISTRIBUTION AND AERODYNAMIC FLOW PATTERNS WITHIN THE COMBUSTOR FRONTEND TO WIDEN COMBUSTOR TURNDOWN FUEL-AIR RATIOS AND REDUCE PATTERN FACTOR. IN THE PROOF-OF-CONCEPT PHASE I EFFORT, RESEARCH VERSIONS OF THE INJECTOR WILL BE DESIGNED, FABRICATED AND TESTED IN A THREE-INJECTOR COMBUSTOR FRONT-END. ATOMIZATION AND IGNITION TESTS WILL BE PERFORMED AT AMBIENT AND COLD (-400F) CONDITIONS. IN PAHSE II, THE ADVANCED INJECTOR DESIGN WILL BE OPTIMIZED BY USING ADVANCED CDF AND ATOMIZATION ANALYSES. THE FINAL DESIGN WILL BE TESTED IN A FULL ANNULAR COMBUSTOR PROVIDED BY GARRETT ENGINE DIVISION. TESTS WITH JP8 FUEL WILL BE PERFORMED AT VARIOUS OPERATING CONDITIONS (E.G. START UP, IDLE, SLTO, ETC.) TO FULLY DEMONSTRATE ITS POTENTIAL TO THE US ARMY.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
Program Manager: JOSEPH V FRITZ
Contract #:
Title: AVIATION TARGET SIMULATION
Topic #: A90-389 Office: AVSCOM ID #: 42170

AMHERST SYSTEMS PROPOSES TO INVESTIGATE TECHNOLOGY FOR A DYNAMIC TARGET GENERATOR CAPABLE OF SIMULATING CORRELATED INFRARED, ULTRAVIOLET, MILLIMETER WAVE, OPTICAL AND ACOUSTIC SENSOR STIMULATION. THE SIMULATOR WILL BE BASED ON THE AMHERST SYSTEMS INFRARED SCENE GENERATOR (IRSG), COMBAT ELECTROMAGNETIC ENVIRONMENT SIMULATOR (CEESIM), AND RADAR ECHO PULSE SIMULATOR (REPS) SYSTEMS WHICH TOGETHER ALREADY PROVIDE CORRELATED RF AND IR SIMULATIONS. THE PHASE 1 EFFORTS WILL DEVELOP THE SPECIFICATIONS FOR UPGRADES TO THESE SYSTEMS WHICH WILL EXTEND THEIR CURRENT CAPABILITIES AND IDENTIFY APPLICABLE OPTICAL AND ACOUSTIC TARGET SIMULATION TECHNOLOGY. DEVELOPMENT OF A COMPLETE INTEGRATED MULTISPECTRAL TARGET SIMULATION CAPABILITY WILL BE PROPOSED AS THE PHASE II EFFORT.

AURORA ASSOCS
3350 SCOTT BLVD - BLDG 33
SANTA CLARA, CA 95054
Program Manager: DR I C CHANG
Contract #:
Title: COMPENSATION TECHNIQUES FOR AMPLITUDE MODULATED FIBER OPTIC SENSOR SYSTEM
Topic #: A90-390 Office: AVSCOM ID #: 42171

A MAJOR DEFICIENCY OF AMPLITUDE MODULATED (AM) FIBER OPTIC SENSORS IS THE LIMITED ACCURACY DUE TO THE ENVIRONMENTALLY INDUCED LOSS VARIATIONS OF THE FIBER-OPTIC TRANSMISSION LINK. THE DUAL WAVE- LENGTH TECHNIQUE HAS SHOWN TO BE INADEQUATE SINCE THE LOSS VARIATIONS ARE WAVELENGTH DEPENDENT. THE OBJECTIVE OF THE PROGRAM IS TO EXPERIMENTALLY CHARACTERIZE THE LOSS VARIATIONS OF THE FIBER OPTIC CABLES AND CONNECTORS AND TO DEVELOP AN EFFECTIVE COMPENSATION TECHNIQUE. TO ACHIEVE THIS GOAL IT IS PROPOSED TO USE A UNIQUE DEVICE, THE ACOUSTO-OPTIC TUNABLE FILTER (AOTF), BOTH AS A TOOL IN THE EXPERIMENTAL INVESTIGATION AS WELL AS A MEANS TO COMPENSATE THE UNCONTROLLED TEMPERATURE EFFECT ON THE LOSS VARIATIONS. IN ADDITION TO PROVIDING THE DESIRED COMPENSATION FOR CABLE AND CONNECTOR LOSS, THE USE OF THE AOTF OFFERS THE FOLLOWING ADVANTAGES: INCREASING SENSOR ACCURACY, STABILITY AND SENSITIVITY, POTENTIAL FOR MULTIPLEXING SENSORS AND COMPACT, RUGGED CONSTRUCTION COMPATIBLE TO MILITARY ENVIRONMENTS.

FAAC INC

777 E EISENHOWER PKWY - STE 650
ANN ARBOR, MI 48108
Program Manager: JOHN P EISENHARDT
Contract #:
Title: KNOWLEDGE BASE DEVELOPMENT FOR ROTORCRAFT MISSION PLANNER
Topic #: A90-391 Office: AVSCOM ID #: 42172

THE PROPOSED EFFORT IS TO DEVELOP A CONCEPT AND A PLAN FOR FURTHER DEVELOPMENT FOR AN IMPROVED METHODOLOGY OF THREAT ASSESSMENT/ POTENTIAL FOR USE BY THE D/NAPS MISSION PLANNER. THE PROPOSED APPROACH IS TO USE THE THREAT EXPERT ANALYSIS SYSTERM (TEAS) CONCEPT DEVELOPED UNDER CONTRACT TO WPAFB AS A STARTING POINT FOR DEVELOPMENT OF A MISSION PLANNER ALGORITHM. TEAS IS DESIGNED TO PROVIDE FIGHTER AIRCRAFT WITH AN INTEGRATED DEFENSIVE RESPONSE TO AN INBOUND THREAT MISSILE. TEAS UTILIZED ALL AVAILABLE ASSETS INCLUDING EARLY MANEUVER, SEEKER DEFEATING MIDCOURSE MANEUVERS, ENDGAME MANEUVERS, EXPENDABLES, ONBOARD ECM AND COMBINATIONS OF THESE. A LIST OF EFFECTIVE OPTIONS IS GENERATED WITH EACH POTENTIAL DEFENSIVE OPTION EVALUATED AS TO ITS IMPACT ON THE MISSION AND ITS FEASIBILITY/ DESIRABILITY GIVEN CURRENT AIRCRAFT STATUS AND CONFIGURATIONS. A RECOMMENDED RESPONSE IS PRESENTED TO THE PILOT WITHIN 1 SECOND OF THE TEAS ALGORITHM BEING INITIATED. FAAC PROPOSES TO ADAPT THE TEAS TECHNOLOGY TO HELICOPTER DEFENSIVE TACTICS AND TO A PRE-LAUNCH, LOOK-AHEAD MODE CAPABLE OF SUPPORTING ROUTE EVALUATION/SELECTION BY THE MISSION PLANNER. USE OF TEAS WOULD ALLOW THE MISSION PLANNER TO ASSESS THE SURVIVABILITY OF A THREAT ENCOUNTER (ASSUMING THE THREAT CANNOT BE AVOIDED BY A ROUTE CHANGE) AND DETERMINE WHAT TACTIC TO BUILD INTO THE MISSION PLAN TO INSURE DEFEAT OF A LAUNCHED MISSILE.

SPECTRA RESEARCH INC
PO BOX 495
DAYTON, OH 45459
Program Manager: PAUL D ZIDEK
Contract #:
Title: EFFECTIVENESS OF ACTIVE VS PASSIVE COUNTERMEASURES
Topic #: A90-392 Office: AVSCOM ID #: 42173

CURRENT AND FUTURE ROTORCRAFT SCENARIOS SUCH AS THE LHX STRESS THE NEED FOR SURVIVABLE OPERATIONS OVER, AROUND, AND THROUGH HOSTILE AIR DEFENSES. KEY TO SATISFYING THIS REQUIREMENT IS REDUCTION OF IR AND RF OBSERVABLES. PROPONENTS OF REDUCED OBSERVABLES TEND TO ARGUE FOR COMPLETE REDUCTION OF RCS TO AVOID DETECTION. ON THE OTHER HAND, THE AIRFRAME DESIGNER IS CONCERNED WITH DEVELOPMENT OF PLATFORM THAT WILL MEET A MULTITUDE OF SPECIFIED OPERATIONAL AND FLIGHT PERFORMANCE REQUIREMENTS. OFTEN THESE REQUIREMENTS CONFLICT AND COMPROMISE IS REQUIRED. FURTHER, ACTIVE AND PASSIVE COUNTER- MEASURES ALSO TAKE ADVANTAGE OF REDUCED SIGNATURES TO IMPROVE THEIR EFFECTIVENESS. TO FULLY REALIZE THE SURVIVABILITY BENEFITS THAT CAN BE ACCRUED REQUIRES QUANTIFICATION OF THESE DESIGN TRADEOFFS THROUGH ANALYTICAL CODE WITH SYSTEMATIC METHODOLOGIES TO EVALUATE BENEFITS. THIS METHODOLOGY MUST DETERMINISTICALLY REPRESENT NUMEROUS ROTORCRAFT/THREAT INTERACTIONS TO IDENTIFY AREAS WHERE IMPROVEMENTS IN OBSERVABLE REDUCTION WOULD OPTIMIZE SURVIVABILITY AND MISSION EFFECTIVENESS. FOR THIS SBIR, SPECTRA RESEARCH (S*R) PROPOSES TO PERFORM THE REQUIRED INTEGRATED COUNTERMEASURE EFFECTIVENESS ANALYSIS FOR THE PRIMARY THREATS AND SCENARIOS OF INTEREST WITH A GRAPHIC WORK-STATION. THIS TOOL WILL DEVELOP ENGINEERING DATA FOR SYSTEM HARDWARE PERFORMANCE TRADE-OFFS RELATED TO OPERATIONAL EFFECTIVENESS. THIS EFFORT WILL INVESTIGATE THE RADIO FREQUENCY (RF) AND INFRARED (IR) SIGNATURES AND BOTH ACTIVE AND PASSIVE COUNTERMEASURES.

SCHWARTZ ELECTRO-OPTICS INC

3404 N ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
Program Manager: RICHARD J WANGLER
Contract #:
Title: HELICOPTER OBSTACLE PROXIMITY SENSOR SYSTEM
Topic #: A90-393 Office: AVSCOM ID #: 42174

THE PROPOSED EFFORT IS TO ANALYZE, DESIGN, AND CONSTRUCT AN OPTICAL RANGE SYSTEM TO BE USED TO SENSE THE PRESENCE OF ANY OBSTACLE WITHIN A 200 FOOT RADIUS OF THE HELICOPTER. WHILE LASER RANGERS HAVE BEEN USED BY THE INDUSTRIAL AND MILITARY COMMUNITITES FOR MANY YEARS, THESE DESIGNS ARE FOR APPLICATIONS DIFFERENT FROM OBSTACLE AVOIDANCE AND THEREFORE MORE COMPLEX AND EXPENSIVE. THE PROPOSED DESIGN USES A GaAs LASER DIODE OPERATING WITH A VERY SHORT PULSE AT A PULSE RATE SUCH THAT RANGE MEASUREMENTS ARE MADE EVERY 3.5 INCHES ON A 400 FOOT DIAMETER CIRCLE ABOUT THE HELICOPTER. THE HORIZONAL SCANNING IS ACCOMPLISHED BY A SIMPLE ROTATING PRISM WITH A SHAFT ENCODER PROVIDING THE AZIMUTHAL ANGLE. THE SENSOR WOULD PROVIDE A COMPLETE NEW PLAN POSITION INDICATOR (PPI) DISPLAY 5 TIMES A SECOND. THE VERY NARROW BEAM AND NARROW PULSE WIDTH WILL PROVIDE GOOD OBSTACLE DEFINITION. THE PROPOSED SYSTEM USES A SIMPLE ANALOG TECHNIQUE FOR MEASURING RANGE WHICH YIELDS HIGH ACCURACY AND ELIMINATES THE MORE COMPLEX, HIGH POWER CONSUMPTION, ULTRA HIGH FREQUENCY DIGITAL COUNTER. THE USE OF AN OPTICAL FIBER DELAY LINE PERMITS THE SYSTEM TO MEASURE THE ZERO RANGE AND ELIMINATES THE TRANSMITTERS MAIN BANG INTERFERENCE WITH THE SENSITIVE OPTICAL RECEIVER.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: THOMAS CAMPBELL
Contract #:
Title: EMBEDDED FIBER OPTIC SENSOR FOR COMPOSITE FLEXBEAMS
Topic #: A90-394 Office: AVSCOM ID #: 42175

A NOVEL FIBER OPTIC SENSOR SYSTEM TO MONITOR THE STRUCTURAL INTEGRITY OF COMPOSITE FLEXBEAMS IN BEARINGLESS HELICOPTER MAIN ROTOR HUBS IS PROPOSED. THE SENSOR SYSTEM UTILIZES A SHORT GAUGE LENGTH BRAGG GRATING SENSOR AND A MANUFACTURING TECHNIQUE WHICH PERMITS THROUGH THE THICKNESS (Z-DIRECTION) INSERTION OF THE SENSOR IN THE COMPOSITE FLEXBEAM WITHOUT DEGRADATION OF PART PROPERTIES. FIBER OPTIC STRESS/STRAIN SENSORS PLACED IN THE Z-DIRECTION WILL BE FAR MORE SENSITIVE TO PLY DELAMINATION THAN CONVENTIONAL IN-PLANE SENSORS. ADDITIONALLY, THE COMPLETE SENSOR SYSTEM WILL PERMIT THE INSPECTION OF THE FLEXBEAM WITH A GROUND BASED INSTRUMENT WITHOUT THE REMOVAL OF THE PITCH CASE ENCLOSURE. THE PHASE I PROGRAM WILL DEMONSTRATE THAT FOSTER-MILLER'S FIBER INSERTION TECHNOLOGY CAN SUCCESSFULLY INSERT SELECTED FIBER OPTIC SENSORS INTO A TYPICAL FLEXBEAM LAMINATE IN THE TRANSLAMINAR DIRECTION AND DEMONSTRATE THAT THE SENSOR SYSTEM IS CAPABLE OF SENSING PLY DELAMINATION PRIOR TO FAILURE.

CREARE.X INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
Program Manager: BHARATAN R PATEL
Contract #:
Title: ADVANCED COMPUTATIONAL FLUID DYNAMICS CODE DEVELOPMENT FOR CENTRIFUGAL COMPRESSORS
Topic #: A90-395 Office: AVSCOM ID #: 42176

IN THIS PROJECT WE PROPOSE TO DEVELOP AN ADVANCED COMPUTATIONAL FLUID DYNAMICS CODE TO AIDE IN THE DESIGN OF HIGHLY LOADED HIGH MACH NUMBER CENTRIFUGAL COMPRESSORS. AN ADVANCED CODE, RAMPANT 1.0, HAS ALREADY BEEN DEVELOPED BY CREARE.X TO PERFORM COMPRESSIBLE FLOW SIMULATIONS IN A WIDE VARIETY OF GEOMETRIC CONFIGURATIONS. THE CODE EMPLOYS UNSTRUCTURED SOLUTION-ADAPTIVE MESHES WITH TETRAHEDRAL CELLS AND A FINITE VOLUME SECOND-ORDER ACCURATE PROCEDURE. IT IS CAPABLE OF FULL THREE-DIMENSIONAL VISCOUS CALCULATIONS. INTERACTIVE SETUP AND GRAPHICS ARE AVAILABLE. THIS CODE REPRESENTS THE STATE OF THE ART IN COMMERCIAL CODES FOR COMPRESSIBLE FLOWS. IN PHASE I, WE PROPOSE TO CONVERT THIS CODE TO ANALYZE HIGHLY LOADED HIGH MACH NUMBER CENTRIFUGAL COMPRESSORS, INCLUDING MODIFICATIONS TO PROVIDE APPROPRIATE BOUNDARY CONDITIONS. IN PHASE II, WE PROPOSE TO USE THIS CODE TO ANALYZE TWO PREVIOUSLY DESIGNED CENTRIFUGAL COMPRESSORS AND THEIR DIFFUSER SYSTEMS. ADDITIONAL ENHANCEMENTS IDENTIFIED IN PHASE I WILL ALSO BE PERFORMED.

CYBERNET SYSTEMS CORP
1919 GREEN RD - STE B-101
ANN ARBOR, MI 48105
Program Manager: HEIDI N JACOBUS
Contract #:
Title: KNOWLEDGE BASE DEVELOPMENT FOR ROTORCRAFT PILOT-VEHICLE INTERFACE
Topic #: A90-396 Office: AVSCOM ID #: 42177

A SIGNIFICANT LEVEL OF EFFORT HAS BEEN DEDICATED TO THE DEVELOPMENT OF SOPHISTICATED DECISION AIDS FOR THE ADVANCED COCKPIT OF THE 1990'S AND BEYOND. THE GOAL OF MUCH OF THIS WORK HAS BEEN TO EQUIP THE FUTURE PILOT OF A MULTI-MISSION AIRCRAFT WITH THE LEVEL OF TACTICAL, AVIONICS, AND MISSION SUPPORT NOW ONLY POSSIBLE IN MULTI-MAN COCKPITS. USE OF ADVANCED ARTIFICIAL INTELLIGENCE SYSTEMS, MELDED INTO AN ELECTRONIC SECOND CREWMAN WHO CAN SENSE EXTERNAL THREATS, MODEL THE PILOT'S CURRENT INTENTIONS AND AWARENESS, AND USE MISSION SPECIFIC INFORMATION DATABASES TO PROVIDE THIS SUPPORTS THIS FUNCTION. WHILE MUCH PROGRESS HAS BEEN MADE IN THE AI SIDE OF THIS PROBLEM, THIS PROGRESS HAS, IN TURN, INCREASED THE DEMAND FOR HIGH QUALITY MULTI-MODALITY COMMUNICATIONS (AND CONTROL) SYSTEMS TO AND FROM THE PILOT. THE LEVEL OF COMPLEXITY REPRESENTED BY CURRENT PROTOTYPE PILOT-VEHICLE INTERFACES (PVI) SUCH AS THE ONE NEEDED FOR ADVANCED ROTORCRAFT DEMANDS: 1) A RATIONAL BASIS FOR EVALUATION AND DESIGN ANALYSIS FOR DISPLAY AND ACTION EXECUTION SYSTEMS. 2) A SCIENTIFICALLY VALIDATED METHOD FOR PREDICTING MULTI-MODAL MULTI-CHANNEL PILOT WORKLOAD AND PERFORMANCE PARAMETERS WHILE USING THE SYSTEMS, AND 3) EXPLORATION OF ALTERNATIVE, PREFERABLY PRECOGNITIVE, METHODS FOR PILOTS/AIRCRAFT COMMUNICATIONS AND CONTROL.

SIMULA INC
10016 S 51ST ST
PHOENIX, AZ 85044
Program Manager: STEPHEN M ARNDT
Contract #:
Title: LIGHTWEIGHT CRASH RESISTANT FUEL TANK MATERIAL
Topic #: A90-397 Office: AVSCOM ID #: 42178

THE INCORPORATION OF CRASHWORTHY, SELF-SEALING FUEL TANKS INTO HELICOPTERS DURING THE LATE SIXTIES RESULTED IN A SUBSTANTIAL REDUCTION OF INJURIES AND FATALITIES CAUSED BY POST-CRASH FIRES. THE TECHNOLOGY USED IN TODAY'S CRASHWORTHY, SLLF-SEALING FUEL TANKS IS THE SAME BASIC TECHNOLOGY THAT WAS DEVELOPED MORE THAN 20 YEARS AGO. VERY LITTLE EFFORT HAS BEEN COMPLETED SINCE THE DEVELOPMENT OF THESE SYSTEMS TO IMPROVE ON THE EXISTING DESIGNS. THE PRIMARY OBJECTIVE OF THIS PHASE I PROGRAM IS TO DEMONSTRATE DESIGN CONCEPTS OF CRASHWORTHY SELF-SEALING FUEL TANKS THAT WOULD OFFER A WEIGHT REDUCTION OF AT LEAST 20

PERCENT OVER THE EXISTING FUEL TANKS. THIS WILL BE ACCOMPLISHED BY RESEARCHING THE TECHNOLOGY DEVELOPED TO DATE. THIS RESEARCH WILL INCLUDE AN INVESTIGATION INTO WHAT MATERIALS, CONFIGURATIONS, AND CONCEPTS HAVE BEEN TRIED, HOW THEY HAVE PERFORMED, AND WHY THEY WERE OR WERE NOT SUCCESSFUL. FROM THIS BASE OF KNOWLEDGE, NEW MATERIALS, CONFIGURATIONS, AND CONCEPTS WILL BE DEVELOPED. THESE SYSTEMS WILL THAN BE EVALUATED THROUGH THE PERFORMANCE OF SCREENING TESTS. FINALLY AN ALGORITHM WILL BE DEVELOPED TO RANK THESE SYSTEMS BASED ON THEIR PERFORMANCE IN THE SCREENING TESTS, CALCULATED SYSTEM WEIGHT ESTIMATES, AND OTHER ESTIMATED PERFORMANCE CHARACTERISTICS. THE RESULTS OF THIS RATING WILL PROVIDE A FOUNDATION FOR THE FUTURE DESIGN AND DEVELOPMENT OF THE "BEST" CONCEPTS UNDER A PHASE II PROGRAM.

INTEGRATED PARALLEL TECHNOLOGY INC
5994 W LAS POSITAS BLVD - STE 209
PLEASANTON, CA 94588
Program Manager: MICHAEL J ROBB
Contract #:
Title: PORTABLE SELF-POWERED HEATING TOOL
Topic #: A90-398 Office: AVSCOM ID #: 42179

A PROTOTYPE, LIGHT WEIGHT, PORTABLE HEATING TOOL, WITH ITS OWN AIR AND POWER SOURCE IS PROPOSED, WHICH CAN DELIVER HEATED AIR TO CURE ADHESIVES AND SHRINK HEAT SHRINKABLE MATERIAL ON FUELED AIRCRAFT. THE PROPOSED TOOL WILL PROVIDE THE CAPABILITY, IN THE FUTURE BATTLEFIELD ENVIRONMENT, FOR THE MILITARY TO PERFORM BATTLE DAMAGE REPAIR AND MAINTENANCE IN REMOTE AREAS WHERE FORCED AIR AND ELECTRIC POWER ARE NOT AVAILABLE. THE PHASE I EFFORT WILL BOTH EXAMINE THE CURRENT METHODOLOGIES FOR REPAIR AND MAINTENANCE OF FUELED AIRCRAFT, UTILIZING HEAT-TO-SHRINK MATERIALS FROM THE AIRCRAFT COMBAT MAINTENANCE/BATTLE DAMAGE REPAIR (ACM/BDR) WIRING AND FLUID LINE REPAIR KITS, AND ALSO DEVELOP, BUILD AND TEST AN ENGINEERING PROTOTYPE HEATING TOOL TO DETERMINE THE FEASIBILITY OF THE PROPOSED CONCEPT.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: ANDREW C HARVEY
Contract #:
Title: ELECTRICALLY DRIVEN LUBE AND SCAVENGE PUMP SYSTEM
Topic #: A90-399 Office: AVSCOM ID #: 42180

CURRENTLY, THE SCAVENGE AND LUBRICATING OIL PUMPS FOR HELICOPTER GAS TURBINE ENGINES ARE MECHANICALLY DRIVEN BY AN ACCESSORY GEARBOX. THIS IMPOSES UNDESIRABLE CONSTRAINTS ON THE DESIGN, LOCATION, AND OPERATION OF THE PUMP ASSEMBLY, AND RESULTS IN GREATER OVERALL ENGINE WEIGHT. IN THE PROPOSED PROGRAM, THE DESIGN OF AN ELECTRICALLY DRIVEN LUBE PUMP SYSTEM WILL BE UNDERTAKEN TO DEVELOP A HIGH SPEED, LIGHTWEIGHT ALTERNATIVE TO THE GEARBOX DRIVEN SYSTEM. WITH SUPPORT FROM GENERAL ELECTRIC AIRCRAFT ENGINES, A NUMBER OF PUMP TYPES WILL BE EXAMINED FOR THE SCAVENGING AND PRESSURE PUMPING FUNCTIONS, TAKING INTO ACCOUNT LITTLE RECOGNIZED LIMITATIONS AND OPPORTUNITIES OF THE APPLICATION. A LIKELY CANDIDATE FOR THE DIFFICULT SCAVENGE PUMP FUNCTION IS A MIXED FLOW INDUCER PUMP, DEBRIS AND INGESTED GAS. PROTOTYPE HARDWARE WILL BE FABRICATED AND TESTED TO DEMONSTRATE THE FEASIBILITY OF THE RESULTING PUMP SYSTEM DESIGN APPROACH. THIS WILL RESULT IN A DEMONSTRATED DESIGN CONCEPT TO BE PURSUED IN PHASE II TO DEVELOP AND PROVE A MIL-QUALIFIABLE LUBE PUMP SYSTEM FEATURING THE RELIABILITY AND PERFORMANCE CHARACTERISTICS REQUIRED FOR THIS CRITICAL APPLICATION IN AN EFFICIENT, COMPACT, AND LIGHTWEIGHT PACKAGE.

PHYSICAL OPTICS CORP
20600 GRAMERCY PL - STE 103
TORRANCE, CA 90501
Program Manager: BEHZAD MOSLEHI
Contract #:
Title: LOW COST FIBER OPTIC DIGITAL POSITION SENSORS FOR APPLICATIONS TO FLY-BY-LIGHT CONTROL SYSTEMS
Topic #: A90-400 Office: AVSCOM ID #: 42181

THE CURRENT TIME DIVISION MULTIPLEXER (TDM) APPROACH USED IN FIBER OPTIC DIGITAL POSITION SENSING USES EXPENSIVE AND TEMPERATURE SENSITIVE FIBER OPTIC DELAY LINES IN THE TRANSDUCER. PHYSICAL OPTICS CORPORATIOM (POC) PROPOSES A MODULAR WAVELENGTH DIVISION MULTIPLEXER (WDM) APPROACH WHICH USES A SINGLE PLANAR HIGH EFFICIENCY (>95%) VOLUME HOLOGRAM IN THE TRANSDUCER. THE HOLOGRAM, WHICH CAN OPERATE IN HIGH TEMPERATURE ENVIRONMENTS, DISPERSE THE BROAD (~200 nm) SPECTURM OF THE INPUT LIGHT FROM THE FIBER ONTO A CODE PLATE MOUNTED ON THE SENSOR MECHANISM. THE ABSOLUTE POSITION IS ENCODED BY THE REFLECTIVE/ABSORPTIVE TRACKS ON THE CODE PLATE WHICH CORRESPOND TO THE DIFFERENT WAVELENGTHS. A DEMULTIPLEXER AND A PHOTODETECTOR ARRAY DECODE THE MODIFIED REFLECTED OPTICAL SPECTRUM. POC IS A LEADER IN FABRICATING HIGH EFFICIENCY WDMs AND VOLUME HOLOGRAPHIC GRATINGS WHICH ARE REQUIRED FOR A PRACTICAL, LOW COST SYSTEM. THE WDM SYSTEM CAN BE ADAPTED TO SHORT (UNDER 1/3 INCH) OR LONG (OVER 6 INCHES) STROKE APPLICATIONS. IN PHASE I, POC WILL PROVIDE A DETAILED DESIGN AND TRADE-OFF ANALYSIS FOR THE ARMY'S APPROVAL. A PRELIMINARY PROTOTYPE WILL ALSO BE CONSTRUCTED AND EVALUATED FOR APPLICATIONS FLY-BY-LIGHT CONTROL SYSTEMS.

AEROSPACE TECHNOLOGY CO
PO BOX 1809
DAHLGREN, VA 22448
Program Manager: DR THOMAS R PEPITONE
Contract #:
Title: INTEGRATED FIRE AND FLIGHT CONTROL TECHNOLOGY
Topic #: A90-402 Office: AVSCOM ID #: 42182

THE INTEGRATED FIRE AND FLIGHT CONTROL (IFFC) SYSTEM CONCEPT EMBODIES THE TOTAL AIRFRAME-DIRECTOR-WEAPON OPERATIONAL EFFECTIVENESS. BY THIS IS MEANT THAT THE DECENTRALIZED AND SOMEWHAT AUTONOMOUS CONTROL OF THE ROTORCRAFT COMBAT SYSTEMS ARE COORDINATED BY A CENTRAL AUTOMATIC CONTROL ELEMENT WHICH, GIVEN SUITABLE OPTIMAL CRITERIA, HAS THE POTENTIAL OF ENHANCING WEAPON DELIVERY ACCURACY WHILE AT THE SAME DIME REDUCING PILOT WORKLOAD. THIS ACCOMPLISHED THROUGH THE COMBINING OF SEVERAL CONTROL FUNCTIONS WHICH WOULD NORMALLY BE COORDINATED BY THE PILOT, AND THE SHARING OF SUBSYSTEM INFORMATION IN THE REAL-TIME CONTROL OF ALL ROTORCRAFT SUBSYSTEMS. THUS THE IFFC CAN, UPON SELECTION BY THE PILOT, ACT AS AN ASSISTANT IN MAINTAINING ROTORCRAFT STABILITY AND CONTROL WHILE THE PILOT DIVERTS ATTENTION TO THE FIRE CONTROL SOLUTION WITHOUT ADVERSE IMPACT ON FLIGHT CONTROL. THE IFFC SYSTEM ARCHITECTURE IS DEFINED BY THE LINEAR DYNAMIC MODEL OF THE ROTORCRAFT, FIRE CONTROL DIRECTOR, LAUNCHER AND WEAPON DYNAMICS. A MODER MULTIVARIABLE SYNTHESIS TECHNIQUE, BASED ON FREQUENCY DOMAIN SENSITIVITY MINIMIZATION OF A SUITABLE INDUCED NORM, SUCH H(oo) CONTROL, ARE USED TO DESIGN THE INTEGRATED FLIGHT CONTROL LAWS TO IMPROVE WEAPON DELIVERY ACCURACY WHILE MAINTAINING ROTORCRAFT HANDLING QUALITIES.

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306

Program Manager: DR WARREN C GIBSON
Contract #:
Title: LARGE SPACE STRUCTURE DESIGN PARAMETERS
Topic #: A90-403 Office: CERL ID #: 42183

ARMY SPACE PLATFORMS WILL HAVE TO BE DESIGNED WITH CLOSE ATTENTION TO STRUCTURAL DYNAMICS PROBLEMS IF THEY ARE TO FULFILL THEIR MISSIONS. STRUCTURAL DESIGN PARAMETERS, ACTIVE CONTROL SYSTEMS, PASSIVE DAMPING, AND ADVANCED MATERIALS MUST BE UNDERSTOOD TO ENSURE THAT THESE PLATFORMS MEET RTHEIR SPECIFICATIONS IN TERMS OF STABILITY, POINTING ACCURACY, SHAPE STABILITY, AND WEIGHT. MANY OF THESE PLATFORMS WILL BE QUITE LARGE, WHICH HAS LED TO AN INTEREST IN SCALE DMODELS, BOTH FOR VERIFICATION OF MATHEMATICAL MODELS AND AS VEHICLES FOR PROOF-OF- PRINCIPLE EXPERIMENTS IN STRUCTURAL ANALYSIS, CONTROL-STRUCTURE INTERACTION, PASSIVE DAMPING, AND RELATED FIELDS. THE PROPOSED WORK WILL PRODUCE AN UNDERSTANDING OF THE DESIGN AND ANALYSIS TECHNIQUES REQUIRED AND OF THE ACTIVE AND PASSIVE CONTROL SYSTEMS NEEDED FOR STIFFNESS AND SHAPE STABILITY OF PROPOSED ARMY SPACE STRUCTURES. THE EFFECTS OF GEOMETRIC AND MATERIAL PROPERTIES WILL ALSO BE INVESTIGATED. THIS WORK WILL ALSO LEAD (IN PHASE II) TO THE DESIGN ANALYSIS, CONSTRUCTIONS, AND TESTING OF A DYNAMICALLY SCALED MODEL OF A LARGE GENERIC SPACE STRUCTURE WITH PAYLOADS. DISTORTED SCALING WILL BE USED AS A MEANS OF PRODUCING REALISTIC DYNAMICS WITHOUT THE HIGH COST AND FRAGILITY OF REPLICA SCALING.

FOSTER-MILLER AVE
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR HARRIS GOLD
Contract #:
Title: SELECTIVE PASSIVATING FILMS FOR LEAD SOLDER JOINTS
Topic #: A90-404 Office: CERL ID #: 42184

LEAD IS TOXIC TO HUMANS AND SUBSTANTIAL, UNSAFE AMOUNTS CAN BE INGESTED FROM DRINKING WATER SUPPLIES UTILIZING LEAD PIPES OR LEAD SOLDERED JOINTS IN COPPER DISTRIBUTION SYSTEMS. SILICATES AND PHOSPHATES ARE CORROSION INHIBITORS THAT ARE KNOWN TO PREVENT THE DISSOLUTION OF LEAD INTO WATER BY THE FORMATION OF A PASSIVATING FILM ON THE SURFACE OF THE METAL. TO SUCCESSFULLY APPLY THIS TECHNIQUE, INFORMATION IS REQUIRED ON THE KINETICS OF FORMATION OF THE PASSIVATING FILM, PARTICULARLY AS FUNCTION OF THE WATER CHEMISTRY. OUR PRELIMINARY LITERATURESEARCH HAS SHOWN THAT SURPRISINGLY LITTLE QUANTITATIVE INFORMATION ON FILM FORMATION ON LEAD SOLDER JOINTS IS AVAILABLE. THIS PROPOSAL ADDRESSES THE IN SITU DEVELOP- MENT OF PASSIVATING COATINGS UTILIZING SILICATE AND PHOSPHATES WITH ADDED THRID COMPONENT LEAD COMPLEXING AGENTS THAT WILL SELECTIVELY COAT THE LEAD RESIDUE FROM THE LEAD SOLDER JOINTS. CONDITIONS FAVORABLE FOR THE RAPID FORMATION OF THESE PASSIVATING FILMS WILL BE IDENTIFIED FOR EACH ADDITIVE USING A TEST LOOP THAT SIMULATES A WATER DISTRIBUTION SYSTEM. WE WILL ALSO DETERMINE WHETHER COMBINING THE THE SILICATE AND JPHOSPHATE ADDITIVES HAS A SYNERGISTIC EFFECT ON PASSIVATION, AND WHETHER LEAD CHELATING AGENTS, EITHER ALONE OR IN COMBINATION WITH THE CORROSION INHIBITORS, CAN BE BENEFICIALLY USED TO SELECTIVELY PASSIVATE LEAD SURFACES.

SEC STRUCTURAL ENGINEERING CONSULTANTS
19804 GRACE HAVEN
YORBA LINDA, CA 92686
Program Manager: DR SHAYAN PAZARGADI
Contract #:
Title: DEVELOPMENT OF AN IMPROVED RAPID SEISMIC ANALYSIS PROCEDURE (RSAP)
Topic #: A90-405 Office: CERL ID #: 42185

DEVELOP AN IMPROVED RAPID SEISMIC ANALYSIS PROCEDURE (RSAP) APPROACH AS RELATED TO TRI-SERVICE MANUAL, ARMY TM 5-809-10-2, SEISMIC DESIGN GUIDELINES FOR UPGRADING EXISTING FACILITIES. THE IMPROVED RSAP INCLUDES DEVELOPMENT OF METHODOLOGY AND ALGORITHM AND MODIFICATION OF EXISTING RSAP TO INCORPORATE RECENT ADVANCES IN THE FIELD OF EARTHQUAKE ENGINEERING, CHANGES IN THE UNIFORM BUILDING CODE AND SEAOC BLUE BOOK AND LEARNINGS OF THE SEISMOLOGY COMMITTEE OF THE SEAOC, AND RECENT ADVANCES IN MICROCOMPUTER PROGRAMMING. THE MODIFICATIONS INCLUDE SUCH STRUCTURAL PARAMETERS AS DAMPING, DUCTILITY, FUNDAMENTAL NATURAL PERIOD, EVALUATION OF BUILDING CAPACITIES AT THE YIELD AND ULTIMATE LEVELS, AND DETERMINATION OF DAMAGE INDEX. PRODUCT OF PHASE I EFFORT WILL AN ALGORITHM THAT WILL LATER USED IN PHASE II TO DEVELOP A SOFTWARE USABLE ON PERSONAL MICROCOMPUTERS THIS SOFTWARE WILL BE AN IMPROVED VERSION OF RSAP THAT REPLACES THE EXISTING ONE.

MANAGEMENT INFORMATION RESOURCES
3621 LOWELL AVE
LINCOLN, NE 68506
Program Manager: MARVIN TWERSKY
Contract #:
Title: A FIBER OPTIC SENSOR TO MEASURE ORTHOGONAL SOIL PRESSURES IN FREEZING AND THAWING SOILS
Topic #: A90-406 Office: CRREL ID #: 42195

THE FREEZING/THAWING ENVIRONMENTS OF FROZEN SOILS CONTRIBUTE TO THE POOR DATA PERFORMANCE TO PRESENT FIELD TRANSDUCERS THAT MEASURE LOAD PRESSURES IN SOILS. IMPROVING SOIL PRESSURE DATA OUTPUT FROM DIURNAL, FROZEN SOILS, THAT INCLUDES ORTHOGONAL PRESSURE DATA, WILL PROVIDE BETTER ENGINEERING INFORMATION FOR COLD REGION STRUCTURES. NEW DEVELOPMENTS IN OPTICAL FIBER "SMART" SENSING TECHNIQUES PROVIDES AN OPPORTUNITY TO FORMULATE AND DESIGN NEW PRESSURE SENSORS THAT WILL MEASURE ORTHOGONAL PRESSURES IN FREEZING/THAWING SOILS. SELECTED COMPLIANT MATERIALS WILL BE CONSTRUCTED INTO POLYHEDRON–ELASTOMERIC-HOUSING STRUCTURES, WHICH CONTAIN EMBEDDED COMPLIANT OPTICAL FIBER MATERIALS, SIZES AND SHAPES. THESE STRUCTURES WILL BE FABRICATED INTO "BREADBOARD MODELS" THAT CONTAIN LEDs AND OPTICAL DETECTORS. LABORATORY TESTS WILL ESTABLISH THE OPTIMUM SENSOR DESIGNS THAT CAN BE MINIATURIZED AND DEVELOPED FOR A PHASE II FIELD PROTOTYPE. PHASE I EFFORTS OFFER THE OPPORTUNITY TO COMBINE OUR NEW NEAR- INFRARED INSTRUMENT, THAT MEASURES SOIL WATER AND SOIL TEMPERATURE, WITH THE SOIL PRESSURE SENSOR PROTOTYPE. A COMMERCIAL MULTI- PARAMETRIC SOIL FIELD INSTRUMENT WILL PROVIDE CIVIL AND STRUTURAL ENGINEERS AND SOIL SCIENTISTS WITH A TOOL TO IMPROVE MONITORING OF FROZEN SOIL PHYSICAL CONDITIONS. IMPROVED SOIL PRESSURE DATA WILL PROVIDE INFORMATION FOR BETTER STRUCTURAL DESIGNS.

MICRO DEVICES CORP
301 N HARRISON ST - BLDG B
PRINCETON, NJ 08540
Program Manager: CRAIG A BURCH
Contract #:
Title: HEAD UP DISPLAY PANEL METER FEATURING LIVE NTSC VIDEO WITH SUPERIMPOSED CONCURRENT MEASUREMENT DATA
Topic #: A90-407 Office: CRREL ID #: 42196

AN EXPLORATORY DEVELOPMENT IS PRESENTED WHICH WILL ENABLE THE CORRELATION OF CRITICAL MEASUREMENTS WITH THE TIME, DATE AND CONCURRENT VIDEO IMAGE OF ICE CONDITIONS. DATA MAY BE ACQUIRED SIMULTANEOUSLY FROM MULTIPLE SENSORS SUCH AS WIND (SPEED AND DIRECTION), TEMPERATURE (AIR, WATER, ICE OR OTHER MATERIALS), PRESSURE (BAROMETRIC, STRAIN OR LOAD),

WATER FLOW RATE OR OTHER TRANSDUCERS. THESE INPUTS WILL BE CONVERTED INTO COMMON UNITS OF MEASURE AND THEY WILL BE PRESENTED SUPERIMPOSED ON THE LIVE VIDEO IMAGE IN A HEAD UP DISPLAY PRESENTATION STYLE. THE COMBINED VIDEO IMAGE WILL BE RECORDED ON VIDEO TAPE. THE LOGGED VIDEO IMAGE WILL CONTAIN THE VISUAL RECORD OF THE PROBLEM, MAY VISUALLY DOCUMENT THE POSITIONING OF THE SENSORS AND WILL CORRELATE THE VISUAL OBSERVATIONS TO THE SENSOR DATA WITH EXCELLENT TEMPORAL ACCURACY. THIS TECHNOLOGY WILL MAKE RETROSPECTIVE ANALYSIS OF THE DATA ACQUIRED IN THE FIELD MUCH MORE PRECISE. THIS INSTRUMENT WILL PROVIDE INFORMATION WHICH COULD BE USED FOR SIMULATION AND MODELING BACK IN THE LABORATORY. SUCH RETROSPECTIVE ANALYSIS MAY LEAD TO NEW METHODS OF CONSTRUCTION, NEW INTERVENTIONAL TECHNIQUES FOR ICE EMERGENCIES AND MAY BE USEFUL IN PROGNOSTICATING THE ABILITY OF EXISTING STRUCTURES TO WITHSTAND PROJECTED ICE LOADS. DOCUMENTATION AND LOGGING OF SCIENTIFIC DATA ABOUT DRIFTING ICE OR OTHER ARCTIC ICE CONCERNS COULD BE ANOTHER APPLICATION OF THE TECHNOLOGY BY THE COLD REGIONS RESEARCH AND ENGINEERING LABORATORY.

GENISYS RESEARCH & DEVELOPMENT INC
201 MILL ST
ROME, NY 13440
Program Manager: MICHAEL J BALDWIN
Contract #:
Title: SYSTEM CONCEPT FOR GEOGRAPHIC INFORMATION SYSTEMS INCORPORATING A USER-BASED APPROACH
Topic #: A90-408 Office: ETL ID #: 42197

GEOGRAPHIC INFORMATION IS CRITICAL TO THE OPERATION AND SUCCESS OF ANY MILITARY GROUND UNIT; THE VALUE OF SUCH INTELLIGENCE IS PROVEN BY THE EXISTENCE OF LARGE GEOGRAPHIC INFORMATION SYSTEMS (GISS) THAT PRODUCE TACTICAL DECISION AIDS (TDAS) SUPPORTING C2 FUNCTIONS. TWO MAJOR DEFICIENCIES HAVE BEEN IDENTIFIED IN CURRENT SYSTEM: GISS ARE DIFFICULT TO USE IN A TACTICAL FIELD ENVIRONMENT AND THEY PRODUCE STATIC OUTPUTS THAT MAY NOT BE EFFECTIVELY MODIFIED WITHOUT STARTING OVER. A CREATIVE SYSTEM INTEGRATION APPROACH IS CALLED FOR; THE PROPOSED APPROACH TAKES ADVANTAGED OF CURRENT ADVANCES IN THREE ENABLING TECHNOLOGY AREAS. FIRST, ADVANCED ARCHITECTURES AND STANDARDS (HIGH PERFORMANCE WORKSTATIONS, X-WINDOWS, MOTIF, UNIX) SUPPORT THE DEVELOPMENT OF MORE COMPLEX SYSTEMS. SECOND, ADVANCE GIS TECHNIQUES MAKE POSSIBLE A STEP INCREASE IN SYSTEM RESPONSIVENESS. THIRD, A USER-BASED DESIGN MITIGATES THE TRAINING ISSUES AND DRIVES THE DEFINITION AND SPECIFICATION OF A MORE EFFECTIVE HUMAN-MACHINE INTERFACE. THE RESULTING SYSTEM PROTOTYPE DEMONSTRATION WIDLL REFLECT AN APPROACH THAT INCORPORATES THE NEWER ENABLING TECHNOLOGIES, AND PERHAPS MORE IMPORTANTLY, BUILDS IN THE TRAINING REQUIREMENTS AT THE FUNCTIONAL SPECIFICATION LEVEL.

MRJ INC
10455 WHITE GRANITE DR - STE 200
OAKTON, VA 22124
Program Manager: SCOTT F MILLER
Contract #:
Title: URBAN WARFARE DIGITAL DATABASE
Topic #: A90-409 Office: ETL ID #: 42199

THE DEPARTMENT OF DEFENSE HAS IDENTIFIED THE INCREASING LIKELIHOOD OF COMBAT IN URBAN ENVIRONMENTS. RECENT YEARS ARE RICH WITH EXAMPLES OF THE MILITARY'S NEED TO PERFORM SUCCESSFULLY IN BUILT-UP AREAS. THE LOGISTICS REQUIREMENTS UNIQUE TO A MILITARY OPERATION IN AN URBAN AREA CALL FOR CAREFUL PLANNING AND WELL TRAINED, WELL REHEARSED FORCES. CREATING A THREE-DIMENSIONAL MODEL OF THE AREA OF INTEREST FACILITIES THIS LEVEL OF PREPARATION. A DIGITAL MODEL THAT NOT ONLY DISPLAYS THE VISUAL CHARACTER OF A SCENE FROM

ANY VIEW ANGLE, BUT ALSO CONTAINS FEATURES INCLUDING BUILDING OR ROADWAY DIMENSIONS MAY BE USED IN THE ANALYSIS OF ISSUES SUCH AS LINE-OF-SIGHT, AREA ACCESS, AND FORCE MOVEMENT AMONG OTHERS. A RAPID AUTOMATED PRO- CEDURE TO CREATE SUCH TOPOGRAPHIC/FEATURE DATABASES IN A TIME OF CRISIS WILL BE INVESTIGATED. THE GOAL OF THIS EFFORT IS TO DEMONSTRATE THE ADVANTAGES OF USING THE CONNECTION MACHINE, A PARALLEL SUPERCOMPUTER AND SOPHISTICATED SOFTWARE APPROACHES SUCH AS STEREO IMAGE ANALYSIS AND FRACTAL ANALYSIS TO CREATE MODELS OF URBAN AREAS FOR USE IN MILITLARY PLANNING AND TRAINING.

SYNECTICS CORP
111 E CHESTNUT ST
ROME, NY 13440
Program Manager: ARNOLD H LANCKTON
Contract #:
Title: LOW INTENSITY CONFLICT VIEWER (LIC-VIEW)
Topic #: A90-409 Office: ETL ID #: 42198

THE LOW INTENSITY CONFLICT VIEWER (LIC-VIEW) IS A TOTAL SYSTEM CONCEPT FOR INTEGRATING FOUR TECHNOLOGIES: COMPUTER GRAPHIC PROCESSING, IMAGE PROCESSING, COMPUTER VISION SYSTEM, AND PHOTO- GRAMMETRY. THE INTEGRATION OF THESE FOUR TECHNOLOGIES IN A TOTAL SYSTEMS CONCEPT, WITH FEEDBACK CONTROL, WILL IMPROVE BOTH THE ROBUSTNESS AND THE PRECISIN OF REMOTELY MEASURING 3-D SURFACES AND OBJECTS AS RECORDED BY STEREOSCOPIC IMAGERY. THIS SYSTEM CONCEPT EXPANDS THE APPLICATION OF THE STEREO PHOTOGRAMMETRIC PROCESSES SO THAT THIS PROCESS CAN BE INTEGRATED WITH HIGH RESOLUTION RECONNAISSANCE IMAGERY TO GIVE THE OPERATOR A DYNAMIC PERSPECTIVE VIEW OF POTENTIAL LOW INTENSITY CONFLICT AREAS. RECENT MILITARY EVENTS HAS CLEARLY SHOWN THAT A LARGE MAJORITY OF THESE LOW INTENSITY CONFLICTS WILL BE CONDUCTED IN VERY DYNAMIC 3-D AREAS SUCH AS URBAN AREAS, MANUFACTURING SITES, TRANSPORTATION CENTERS, ETC. THE LIC- VIEW WILL PROVIDE HIGH RESOLUTION PERSPECTIVE VIEWS OF THESE DYNAMIC 3-D AREAS SO THAT MILITARY OPERATIONS CAN BE REHEARSED, ANALYZED, AND DETAILED MANEUVERS PLANNED PRIOR TO COMMITMENT OF FORCES.

ALLING G C JR
73 VARNUM ST
ARLINGTON, MA 02174
Program Manager: GORDON C ALLING JR
Contract #:
Title: BRIGADE LEVEL HARD COPY DEVICE
Topic #: A90-410 Office: ETL ID #: 42200

THE UNIVERSE OF AVAILABLE TECHNOLOGIES WILL BE EVALUATED AGAINST REQUIREMENTS FOR A BRIGADE OF LOWER LEVEL DEVICE INTENDED TO PRINT MAP DATA. THE OBJECTIVES OF THE PROJECT WILL BE TO SELECT THE BEST TECHNOLOGY FOR A BRIGADE LEVEL HARD COPY DEVICE AND TO OUTLINE THE PHASE II PROGRAM STEPS NEEDED TO BRING THE PRODUCT TO FRUITION. THE PROPOSED PROGRAM WILL INCLUDE THREE STEPS. IN THE FIRST, WE WILL IDENTIFY FUNCTIONAL REQUIREMENTS. IN STEP 2, WE WILL IDENTIFY HARD COPY TECHNOLOGIES AND CONSTRUCT A MATRIX LISTING THE CAPABILITIES OF EACH TECHNOLOGY IN TERMS OF THE REQUIREMENTS. AT THE END OF STEP 2, WE WILL SELECT THE PREFERRED TECHNOLOGY AND IN STEP 3, PLAN A PHASE II EFFORT TO DEMONSTRATE A PROTOTYPE DEVICE BASED ON THIS TECHNOLOGY. THE MAJOR OUTPUTS OF THIS STUDY WILL BE A DETAILED COMPARISON OF THE HARD COPY TECHNOLOGIES REVIEWED AND A PLAN FOR A PHASE II HARDWARE DEVELOPMENT EFFORT.

DAEDALUS ENTERPRISES INC
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ANN ARBOR, MI 48106
Program Manager: KEITH A MORE
Contract #:
Title: SENSORS AND TECHNOLOGY FOR MINEFIELD DETECTION FROM SPACE
Topic #: A90-411 Office: ETL ID #: 42201

A STUDY WILL BE PERFORMED TO EXTRAPOLATE THE REMIDS AND AMIDARS STANDOFF MINE DETECTION SYSTEMS TO A SPACE PLATFORM. A PARAMETRIC STUDY WILL DEFINE THE TECHNOLOGY REQUIRED FOR A SPACE-BASED MINE DETECTION SYSEM. CURRENT TECHNOLOGY IN STANDOFF MINE DETECTION, SPACE OPTICS, LASER TRANSMITTER/RECEIVERS, FOCAL PLANE ARRAYS AND HIGH SPPED DATA PROCESSING TRANSMISSION WILL BE EVALUATED AGAINST THE REQUIREMENTS GENERATED IN THE PARAMETRIC STUDY. THE TECHNOLOGY EVALUATION WILL INCLUDE A STUDY OF AN INNOVATIVE MULTIPIXEL COHERENT LASER TRANSMITTER/RECEIVER CURRENTLY UNDER DEVELOPMENT BY DAEDALUS UNDER A NASA SBIR. THIS INNOVATIVE LASER IMAGER MAY PROVIDE THE ORDERS OF MAGNITUDE INCREASE IN SENSITIVITY NEEDED TO MAKE A SPACEBORNE MINE DETECTION SYSTEM PRACTICAL. THE STUDY WILL DEFINE THE REQUIREMENTS FOR A SPACEBORNE MINE DETECTION SYSTEM AND AN EVALUATION OF CURRENT TECHNOLOGY TO SUPPORT THE DEVELOPMENT OF THE SYSTEM. THE STUDY WILL SHOW WHERE TECHNOLOGY ADVANCEMENTS ARE NEEDED AND THE STUDY WILL RECOMMEND HIGH-PAYOFF TECHNOLOGY DEVELOPMENT TASKS FOR PHASE II.

TRIFID CORP
744 OFFICE PKWY - STE 224
ST LOUIS, MO 63141
Program Manager: DR MARSHALL B FAINTICH
Contract #:
Title: DEVELOPMENT OF A STATISTICAL METHOD FOR THREE-DIMENSIONAL TERRAIN ELEVATION ERROR ANALYSIS
Topic #: A90-412 Office: ETL ID #: 42202

DEPENDING UPON THE SPECIFIC APPLICATION, ANY COMBINATION OF ABSOLUTE, RELATIVE , NON-RADOM, AND ARTIFACT ERRORS IN THE DTED MAY PRODUCE A WIDE VARIATION OF ERRONEOUS INPUT TO THE TACTICAL DECISIONS MADE BY A FIELD COMMANDER. OPERATIONS SUCH AS TERRAIN MASKING, LINE OF SIGHT COMPUTATIONS, MISSION AND OPTIMAL ROUTE PLANNING, COMMUNICA- TION EQUIPMENT DEPLOYMENT, GROUND AUTONOMOUS VEHICLE MOVEMENT, PASSIVE RANGING, PRECISION PROJECTILE LOCATION DETERMINATION, AND CROSS COUNTRY MOBILITY ANALYSIS ARE CRITICALLY AFFECTED DTED ACCURACY. THE PHASE I TECHNICAL OBJECTIVES CAN BE BROADLY STATED AS FOLLOWS: 1. PERFORM A REQUIREMENTS ANALYSIS TO DETERMINE PRIMARY TACTICAL DECISION OPERATIONS TO BE CONSIDERED IN ORDER TO EMPHASIZE ERROR MEASUREMENT TECHNIQUES FOR THESE OPERATIONS. 2. DEVELOP A SET OF ENGINEERING PROCEDURES FOR THE ANALYSIS OF ABSOLUTE, RELATIVE, AND NON-RANDOM/ARTIFACT ERRORS ASSOCIATED WITH DTED; 3. PROCESS AN EXISTING DTED CELL WITH THE FULL COMPLEMENT OF AVAILABLE PROCEDURES; 4. NUMERICALLY AND GRAPHICALLY COMPARE THE RESULTS OF THE ERROR ANALYSIS WITH A COMPARISON BETWEEN THE DTED CELL AND A HIGHLY ACCURATE CONTROL SET OF ELEVATIONS OVER THE SAME AREA; 5. PREPARE A TECHNICAL REPORT ON THE FINDINGS OF THE STUDY.

VEXCEL CORP
2477 - 55TH ST
BOULDER, CO 80301
Program Manager: DR WOLFGANG KOBER
Contract #:
Title: SYMBOLIC MODEL-BASED SAR FEATURE ANALYSIS AND CHANGE DETECTION
Topic #: A90-413 Office: ETL ID #: 42203

VEXCEL CORP PROPOSES A PHASE I RESEARCH EFFORT TO DEMONSTRATE THE FEASIBILITY OF A SYMBOLIC MODEL-BASED APPROACH FOR CHANGE DETECTION AND EXTRACTION OF MILITARY TERRAIN FEATURES IN SYNTHETIC APERTURE RADAR (SAR) IMAGERY THE PHASE I EFFORT WILL CONCERN THE DEVELOPMENT OF A RULE/FRAM BASED DESCRIPTION OF QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF ONE SINGLE FEATURE TYPE, AND DEMONSTRATIONS OF ITS EXTRACTION USING SUITABLE, LOW-LEVEL IMAGE PROCESSING PROCEDURES. THE PHASE II SYSTEM WILL BE ENTIRELY HOSTED ON A SUN-4 HARDWARE PLATFORM UNDER UNIX/C AND NEXPERT SOFTWARE ENVIRONMENT. THE PHASE I FEASIBILITY DEMONSTRATION OF THE SYMBOLIC PROCESSING WILL USE NEXPERT OBJECT V1.1 HOSTED ON THE MACINTOSH IIX, WITH THE IMAGE PROCESSING PROCEDURES HOSTED ON A SUN-4.

MATRIX MANAGEMENT GP
811 FIRST AVE - STE 466
SEATTLE, WA 98104
Program Manager: S EDWARD BOSELLY III
Contract #:
Title: IMPACT OF CLIMATE CHANGE ON MILITARY ACTIVITIES
Topic #: A90-414 Office: ETL ID #: 42204

GLOBAL WARMING, CLIMATE CHANGE, OZONE LAYER DEPLETION ARE TOPICS OF SCIENTIFIC AND PUBLIC INTEREST. THE POTENTIAL IMPACTS OF THESE CHANGES INCLUDES SEA LEVEL RISE, CHANGES IN PRECIPITATION PATTERNS, ELIMINATION OF ARABLE LAND, AND ALTERATIONS OF NAVIGABLE WATERWAYS. EACH OF THESE IMPACTS HAS FURTHER IMPACT ON MILITARY ACTIVITIES AND OPERATIONS. PLANNING, POLICY MAKING, STRATEGY DEVELOPMENT, AND BUDGETING SHOULD CONSIDER THESE IMPACTS FOR THE MILITARY FORCE STRUCTURE OF THE FUTURE. THIS PROJECT WILL DEVELOP A KNOWLEDGE BASE OF CLIMATE CHANGE SCIENTIFIC LITERATURE AND AN UNDERSTANDING OF CLIMATE CHANGE MODELS. LATEST TECHNIQUES FOR LITERATURE SEARCHING WILL BE USED. CLIMATE CHANGE MODEL SHORTFALLS WILL BE DESCRIBED. UPON COMPILATION OF THE LITERATURE, ANALYSIS WILL FOCUS ON GENERAL CONSENSUS OF CLIMATE PROJECTION AND ITS IMPACT ON THE EARTH- ATMOSPHERE SYSTEM. FROM THESE, THE IMPACTS ON MILITARY OPERATIONS AND ACTIVITIES WILL BE ASSESSED. PARTICULAR ATTENTION WILL BE GIVEN TO US ARMY CORPS OF ENGINEERS ACTIVITIES ASSOCIATED WITH SHORELINE AND COASTAL ZONE MANAGEMENT ISSUES, AND CONSTRUCTION, MAINTENANCE AND OPERATION OF DAMS AND WATERWAYS. CONCLUSIONS WILL BE DRAWN TO PROVIDE A BASIS FOR FUTURE PLANNING AND OPERATIONS.

BECKUS CORP INC
PO BOX 882
NORFOLK, NE 68702
Program Manager: THOMAS W BECKENHAUER
Contract #:
Title: PENETRATING SEALANTS
Topic #: A90-415 Office: ETL ID #: 42205

BECKUS CORP INC PROPOSES TO RESEARCH AND DEVELOP PRODUCTS WHICH WILL REVOLUTIONIZE THE STATE OF THE ART IN CONCRETE SEALANTS. MUCH OF THE PROPOSED RESEARCH HAS ALREADY BEEN ACHIEVED IN THE COURSE OF DEVELOPING OTHER BECKUS PRODUCTS. BECKUS HAS DEVELOPED AND PATENTED THE ONLY KNOWN CURE FOR MASONRY EFFLORESCENCE. IN THE COURSE OF THIS AND MANY OTHER DISCOVERIES BECKUS HAS ACQUIRED THE SKILL AND TECHNOLOGY NECESSARY TO SUCCESSFULLY ACHIEVE THE PROPOSED GOALS. AN UNDERSTANDING OF SURFACE TENSION, PENETRATION, CAPAILLARY ACTION, AND INTERNAL MOVEMENT OF MOISTURE IS THE BASIS OF SEVERAL BECKUS PRODUCTS. BECKUS HAS ALSO ACHIEVED ADVANCEMENTS IN TECHNOLOGY WHICH INCREASES THE COMPRESSIVE STRENGTH OF CONCRETE. THE OBJECTIVES OF THE PROJECT ARE TO PENTRATE CONCRETE TO A DEPTH OF 18 INCHES AND TO IMPART WATER REPLELENCY, RESTORATION, AND DURABILITY TO THE CONCRETE TO THE 18 INCH DEPTH OF PENETRATION. BECKUS IS CONFIDENT THAT WILL ACHIEVE THESE GOALS!

GEO-SYSTEMS ENGINEERING INC
11637 W 83RD TER
LENEXA, KS 66214
Program Manager: DR GLEN FERGUSON
Contract #:
Title: IN-SITU TEST DEVICE TO DETERMINE LATERAL EARTH PRESSURE
Topic #: A90-416 Office: ETL ID #: 42206

LATERAL EARTH PRESSURE IS FUNDAMENTAL TO MUCH OF SOIL MECHANICS, AND VITAL TO THE SOLUTION OF MAY PRACTICAL PROBLEMS INCLUDING COMPUTERIZED SOLUTIONS FOR BEARING CAPACITIES AND FOR STABILITY OF TUNNELS, SLOPES AND WALLS. UNFORTUNATELY, THE KEY ROLE OF LATERAL STRESS HAS TENDED TO BE PASSED OVER IN ENGINEERING INVESTIGA- TIONS BECAUSE OF DIFFICULTIES IN ITS MEASUREMENT. ASSUMED VALUES OR VALUES BASED ON SOME VERY LOOSE EMPIRICAL CORRELATIONS FREQUENTLY ARE USED DESPITE AN ACKNOWLEDGED AND DEMONSTRABLE ERROR THAT USUALLY WILL RESULT IN OVERDESIGN. THE PROBLEMS IN MEASUREMENT FOR THE MOST PART DERIVE FROM THE SENSITIVITY OF SOIL STRESS TO INTRODUCTION OF A MEASURING DEVICE. THE SEVERAL APPROACHES TO THIS AND OTHER MEASUREMENT PROBLEMS WILL E ANALYZED AND EVALUATED, WITH SPECIAL ATTENTION TO PROBABLE EFFECTS ON SOIL BEHAVIOR AS IT PERTAINS TO ACCURACY AND RELIABILITY OF EACH TYPE OF TEST. AN EXISTING DATABASE OF KO STEPPED BLADE, DILATOMETER, AND PRESSURE- METER DATA WILL BE USED TO HELP SELECT ONE OR AT MOST TWO APPROACHES OR TEST PROCEDURES FOR FURTHER INVESTIGATION, IMPROVEMENT, AND USE DURING PAHSE II.

FLOW INC
6127 SW CORBETT
PORTLAND, OR 97201
Program Manager: DR MICHAEL T MAKLER
Contract #:
Title: METHOD FOR EVALUATION OF DRUG RESISTANCE FOR PLASMODIUM FALCIPARUM
Topic #: A90-421 Office: MEDICAL ID #: 42207

THE DETECTION OF DRUG RESISTANT FORMS OF PLASMODIUM FALCIPARUM HAS TRADITIONALLY REQUIRED A 24-48 HR CULTURE PERIOD WITH ANALYSIS CONDUCTED BY MICROSCOPICALLY MEASURING THE LEVEL OF PARASITEMIA FOR EACH TEST POINT. IT IS OUR INTENT TO MODIFY THIS PROCEDURE TO ALLOW EARLIER DETECTION OF THE DRUG RESISTANT FORM OF THE PARASITE AND TO PERMIT THIS DETECTION TO BE MADE WITH SIGNIFICANT REDUCTION IN MAN-POWER REQUIREMENTS. THE ASSAY IS BASED ON DETECTION OF METABOLIC METABOLIC PRODUCTS OF THE PARASITE DURING ITS GROWTH PHASE. THESE METABOLIC PRODUCTS WILL BE MEASURED BY STANDARD TECHNIQUE. THUS THE ASSAY FOR DRUG RESISTANCE WILL BE DEPENDENT ON AN ALTERATION OF THE METABOLISM OF THE PARASITE RATHER THAN DIRECT MEASUREMENT OF PARASITE MULTIPLICATION.

SAT-CON TECHNOLOGY CORP
12 EMILY ST
CAMBRIDGE, MA 02139
Program Manager: DR VIJAY GONDHALEKAR
Contract #:
Title: MAGNETICALLY SUSPENDED MULTIPURPOSE CENTRIFUGE
Topic #: A90-423 Office: MEDICAL ID #: 42209

CENTRIFUGES OPERATING IN A FIELD ENVIRONMENT HAVE TO BE COMPACT, LIGHT WEIGHT, RUGGED AND RELIABLE BY DEFINITION. AVAILABLE CENTRIFUGES HAVE RELIABILITY ISSUES RELATED TO THE ROBUSTNESS OF THE MECHANISMS SUPPORTING THE CENTRIFUGE ROTOR. THE MASS IMBALANCE

INTRODUCTED ON THE ROTOR BY ASYMMETRICALLY LOADED TUBES AGGRAVATES THIS PROBLEM CONSIDERABLY. THE DRIVE MOTOR AND ASSOCIATED ELECTRONICS IS ANOTHER AREA WHICH COULD BENEFIT CONSIDERABLY FROM TECHNOLOGY ENHANCEMENT. THIS PROPOSAL PUTS FORWARD AN INNOVATIVE APPROACH SYNTHESIZED FROM TECHNOLOGY DEVELOPED FOR GYROSCOPES AND SPACE RELATED ROTATING SYSTEMS TO ARRIVE AT A CENTRIFUGE DESIGN WHICH WILL BE LIGHT WEIGHT AND ROBUST TO THE PROBLEMS ENCOUNTERED WITH EXISTING DESIGNS. THE ROTOR IS PROPOSED TO BE MAGNETICALLY SUSPENDED AND DRIVEN BY A MOTOR INTEGRATED INTO THE CENTRIFUGE ROTOR STRUCTURE AND POWERED BY AN ADVANCED ELECTRONIC DRIVE. THE SUSPENSION SYSTEM IS INTRINSICALLY INSENSITIVE TO MASS UNBALANCE. THE INTEGRATED STRUCTURE AND THE EFFICIENT ELECTRONICS WILL HELP REDUCE THE OVERALL WEIGHT. A PROTOTYPE MODEL IS PROPOSED TO BE DESIGNED AND CONSTRUCTED FOR PHASE I AND A PRODUCTION DESIGN CENTRIFUGE FOR PHASE II.

TECHNICAL RESEARCH ASSOCS
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
Program Manager: OWEN D BRIMHALL
Contract #:
Title: DEVELOPMENT OF MULTIPURPOSE CENTRIFUGE
Topic #: A90-423 Office: MEDICAL ID #: 42208

TRA PROPOSES TO DEVELOP, CONSTRUCT, AND PRODUCE A SMALL (130 IN [3]) LIGHTWEIGHT (2-3 LBS) MULTIPURPOSE MEDICAL CENTRIFUGE FOR COMBAT CASUALTY CARE UNITS. THE CENTRIFUGE WILL BE POWERED BY EITHER 110-220 VAC, 50-60 Hz OR BATTERIES AND WILL BE DESIGNED AND TESTED TO OPERATE IN EXTREME TEMPERATURE, MECHANICAL SHOCK AND VIBRATION CONDITIONS. OPERATION WILL BE MICROPROCESSOR CONTROLLED TO MINIMIZE USER INTERFACE AND WILL USE STANDARD MEDICAL DISPOSABLE SUPPLIES. AS A MINIMUM THE CENTRIFUGE WILL BE EQUIPPED TO PERFORM MICROHEMATOCRIT, URINE SEDIMENT, FECAL CONCENTRATION, PLASMA PREPARATION AND QBC II TUBE CENTRIFUGATION. ONE PROTOTYPE MULTIPURPOSE CENTRIFUGE WILL BE DELIVERED FOR ARMY EVALUATION AT THE END OF PHASE I. IN PHASE II TRA WILL QUALIFY THE CENTRIFUGE TO ARMY AND FDA REQUIREMENTS AND PRODUCE 25 PRODUCTION UNITS FOR ARMY FIELD TESTING.

RIDGE-COM INC
354 W LANCASTER AVE - STE 219
HAVERFORD, PA 19041
Program Manager: DR SHIRA KRAMER
Contract #:
Title: DEMONSTRATE THE FEASIBILITY OF PRODUCING A POWDERED COLD STERILIZING AGENT
Topic #: A90-424 Office: MEDICAL ID #: 42210

A COLD-WATER SOLUBLE, DRY-POWDERED FORMULATION CALLED ULTRA-KLEEN HAS BEEN DEVELOPED, WHICH HAS BEEN SHOWN TO BE A DISINFECTANT WITH STERILIZING CAPABILITIES IN LABORATORY STUDIED AND IN FOOD PROCESSING PLANTS IN WHICH IT HAS BEEN USED. ULTRA-KLEEN HAS BEEN DEMONSTRATED TO HAVE THE ANTIMICROBIAL EFFICACY AND TOXICOLOGICAL PROPERTIES REQUIRED BY EPA FOR REGISTRATION AS A DISINFECTANT, FOR USE IN HOSPITAL AND MEDICAL ENVIRONMENTS. SPECIFICALLY, LABORATORY STUDIES CONDUCTED TO DATE HAVE SHOWN THAT ULTRA-KLEEN IS BACTERIOCIAL AGAINST PSEUDOMONAS AERUGINOSA, STAPHYLOCOCCUS AUREUS, SALMONELLA CHOLERAESUIS, AND LISTERIA MONOCYTOGENES. SPORICIDAL ACTIVITY HAS BEEN DEMONSTRATED AGAINST BACCILLUS SUBTILIS, CLOSTRIDIUM SPOROGENES, AND HEAT-RESISTANT ASCOSPORES OF NEISARTARYA FISCHERI. CONDITIONS FOR ACHIEVING 100% EFFICACY AGAINST SPORES, AS REQUIRED FOR REGISTRATION AS A STERILIZING AGENT, ARE CONSIDERED TO BE ACHIEVABLE WITH FURTHER STUDY. BASED UPON TEST RESULTS THUS FAR. CURRENTLY AVAILABLE STERILANTS ARE HIGHLY TOXIC TO MAN, AND ARE NOT AVAILABLE IN POWDERED FORM. ULTRA-KLEEN IS UNIQUE BECAUSE IT IS BASED UPON THE

FORMATION OF ION PAIRS COMPOSED TO PEROXIDE IONS AND A SPECIALLY-STRUCTED QUATERNARY AMMONIUM SALT. THESE ION PAIRS ARE NOT ONLY SOLUBLE IN AQUEOUS MEDIA, BUT THEY ALSO PENETRATE EFFECTIVELY INTO LIPID PHASES, EFFECTING SAPONIFICATION, OXIDATION, AND ANTIMICROBIAL ACTIVITY.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
Program Manager: DR SHELDON S SANDLER
Contract #:
Title: LATERAL WAVE LOCATOR FOR RADIOTRANSPARENT FOREIGN BODIES
Topic #: A90-425 Office: MEDICAL ID #: 42211

GEO-CENTERS, INC. PROPOSES TO DEMONSTRATE THE FEASIBILITY OF USING A LATERAL WAVE DETECTOR TO LOCATE SMALL NON-METALLIC BODIES IN HUMANS. THE PROPOSED CONCEPT HAS A FIXED TRANSMITTER PROE ON THE SURFACE AND A MOVEABLE RECEIVER WHICH PICKS UP THE LATERAL WAVE REFLECTIONS FROM THE SMALL BODY. A MODEL BASED STUDY USING SMALL SPHERICAL BODIES IN TISSUE WILL YIELD THE BASIC INFORMATION FOR DETECTION. OTHER FOREIGN BODIES AND CLUTTER WILL BE ADDED TO PROVE DETECTION IN THE PRESENCE OF OTHER REFLECTORS. THE RESULTS ON THE SPHERICAL MODEL WILL BE COMBINED WITH THE KNOWN PROPERTIES OF LATERAL WAVES TO PRODUCE A RESULT CHARACTERISTIC FOR THE ENTIRE SYSTEM.

ROCHESTER PHOTONICS CORP
67 NETTLECREEK RD
FAIRPORT, NY 14450
Program Manager: DR DEAN FAKLIS
Contract #:
Title: DIFFRACTIVE MULTI-COLOR PHOROPTOR BASED ON LASER SPECKLE
Topic #: A90-426 Office: MEDICAL ID #: 42212

RELATIVE MOTION BETWEEN AN OBSERVER AND A SCATTERING SCREEN ILLUMINATED WITH COHERENT LIGHT CAN CAUSE THE RESULTING SPECKLE PATTERN TO SCINTILLATE. THE RELATIVE DIRECTION OF MOVEMENT OF THE SPECKLE PATTERN AS OBSERVED BY THE EYE IS SIMPLY RELATED TO THE AXIAL LOCATION OF THE CORRESPONDING IMAGE IN THE EYE. THE RELATIVE DIRECTION OF MOTION CAN THEREFORE BE USED TO MEASURE THE REFRACTIVE ERROR OF THE EYE. IF THE SPECKLES DO NOT MOVE BUT SEEM TO BOIL IN SPACE, THE OBJECT IS DETERMINED TO BE CONJUGATE TO THE RETINA. THE PRIMARY OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEMONSTRATE THE FEASIBILITY OF A LENSLESS, MULTI-COLOR PHOROPTOR SYSTEM THAT USES LASER SPECKLE AND DIFFRACTIVE OPTICS TECHNOLOGY. WE PROPOSE TO DESIGN EYE-SAFE INSTRUMENTATION THAT CAN BE PRODUCED IN VOLUME AND AT LOW-COST. THE INSTRUMENT MUST BE EASY TO OPERATE AND THE DATA SHOULD REQUIRE LITTLE OR NO FURTHER ANALYSIS. THE VISION TEST SHOULD REQUIRE THE PATIENT TO PROVIDE ONLY SIMPLE ANSWERS TO QUESTIONS REGARDING SPECKLE MOTION. WE PLAN TO IDENTIFY INNOVATIVE DESIGNS THAT EMPLOY A MINIMUM OF OPTICAL ELEMENTS WITHOUT SACRIFICING PERFORMANCE OR LIGHT EFFICIENCY WHILE MAINTAINING MECHANICAL STABILITY. DURING PHASE I, WE PROPOSE TO GENERATE DETAILED OPTICAL DESIGNS AND FABRICATE A BREADBOARD MULTI-COLOR LASER PHOROPTOR. WE ALSO PLAN TO INVESTIGATE INNOVATIVE USES OF CONVENTIONAL AND DIFFRACTIVE OPTICS IN NEW DESIGNS FOR FUTURE-GENERATION SYSTEMS THAT UTILIZE RED, GREEN AND BLUE VISIBLE LASER DIODES. THE MANUFACTURABILITY OF THE SYSTEM COMPONENTS WILL BE STUDIED. A FIRST-ORDER TOLELRANCE ANALYSIS WILL BE UNDERTAKEN FOR THE MOST PROMISING DESIGNS. WE ALSO PLAN TO HELP DEFINE IMPORTANT ENVIRONMENTAL REQUIREMENTS INCLUDING STABLE MATERIALS AND RUGGED MECHANICAL MOUNTING TECHNIQUES. THE PROPOSED RESEARCH AND DEVELOPMENT WILL CONCENTRATE ON FABRICATING SYSTEMS USEFUL TO THE ARMY. IT IS EXPECTED THAT BOTH PHASE I AND PHASE II DEVELOPMENT EFFORTS WILL LEAD TO VERSATILE AND COMMERCIALLY VIABLE PHOROPTOR SYSTEMS.

ADVANCED TECHNOLOGY MATERIALS INC
520-B DANBURY RD
NEW MILFORD, CT 06776
Program Manager: SOO-HEE TAN
Contract #:
Title: CONTACTS FOR DIAMOND SEMICONDUCTOR DEVICES
Topic #: A90-427 Office: SDC ID #: 42216

SEMICONDUCTOR DEVICES THAT PROVIDE RELIABLE HIGH POWER OR OPERATE AT EXTREMELY HIGH FREQUENCY IN HARSH ENVIRONMENTS SUCH AS SUSTAINED HIGH RADIATION LEVELS ARE REQUIRED FOR ASAT APPLICATIONS. THIS NEED FOR DEVICES THAT CAN OPERATE AT INCREASED TEMPERATURES OR WITH MINIMUM RADIATIVE COOLING HAS BEEN SPAWNED BY THE SIGNIFICANT ENGINEERING PROBLEMS ASSOCIATED WITH THE COOLING REQUIREMENTS OF ELECTRONICS IN SUPERSONIC AIRCRAFT AND SPACE BASED VEHICLES. BECAUSE OF ITS HIGH INTRINSIC RESISTIVITY, LARGE CARRIER MOBILITIES, HIGH SATURATED CARRIER DRIFT VELOCITY, AND RADIATION AND CHEMICAL CORROSION RESISTANCE, DIAMOND IS AN IDEAL CANDIDATE FOR EXTREMELY FAST, HIGH TEMPERATURE SEMICONDUCTOR DEVICES. ATM HAS RECENTLY SHOWN THAT DIAMOND FILMS WITH EXTREMELY HIGH RESISTIVITY AND NO SUB BAND-GAP CONDUCTIVITY CAN BE GROWN. HOWEVER, THE KEY TO A SUCCESSFUL DEVELOPMENT OF DIAMOND DEVICES ARE STABLE AND LOW RESISTANCE CONTACTS. IN PHASE I THE FEASIBILITY OF A NOVEL CONTACT PROCESS TO BOTH n-TYPE AND p-TYPE DIAMONDS WILL BE EXAMINED. IN PHASE II, AN OPTIMAL CONTACTING PROCESS WILL BE DEVELOPED AND OPERATING PROTOTYPE DEVICES TARGETED AT ASAT APPLICATIONS WILL BE DELIVERED TO THE STRATEGIC DEFENSE COMMAND.

COMPLEX SYSTEMS RESEARCH INC
4395 EL PRIETO RD
ALTADENA, CA 91001
Program Manager: PHILLIP ALVELDA
Contract #:
Title: NONLINEAR SIGNAL PROCESSING USING DYNAMICAL SYSTEMS
Topic #: A90-428 Office: SDC ID #: 42217

THE PROPOSED NONLINEAR DYNAMICS METHODOLOGY PROMISES A FOUNDATION FOR A REVOLUTIONARY MICRO-ELECTRONIC TECHNOLOGY THAT COULD PERFORM HIGHLY PARALLEL REAL TIME SIGNAL PROCESSING TASKS SIMILAR TO FOURIER SPECTROGRAPHY WITHOUT A MICROPROCESSOR. IN ADDITION TO FREQUENCY COMPONENT EXTRACTION, THE PROPOSED NONLINEAR SENSORS INTEGRATE AND ENCODE SIGNAL TIME-HISTORY BY UTILIZING JUMP PHENOMENA. THE DEVELOPMENT OF A NEW GENERATION OF SENSOR AND SIGNAL PROCESSING SYSTEMS THAT TRANSDUCE AND ENCODE TEMPORAL INFORMATION IN COMPLEX SIGNALS WOULD BE INVALUABLE, MOST PARTICULARLY IN RECOGNITION TASKS WHERE SIGNAL COMPONENTS HAVE CHARACTERISTIC TIME-EVOLUATIONS AND VARIANCES. THIS PROPOSAL INCLUDES PRELIMINARY EXPERIEMNTAL RESULTS WHICH DEMONSTRATE THE UTILITY OF THIS NEW COMPUTATIONAL FRAMEWORK AS APPLIED TO TWO DIMENSIONAL (ACOUSTIC: SIGNAL VS. TIME) AND THREE DIMENSIONAL (128X128X256-GREY-SCALE IMAGES) SIGNAL PROCESSING TASKS. OVERALL, THE PROPOSED WORK WOULD INTRODUCE A FOUNDATION FOR A NEW SENSOR AND SIGNAL PROCESSING TECHNOLOGY OF GREAT VALUE THAT CLOSELY PARALLELS AND AUGMENTS ON- GOING NONLINEAR SCIENCE AND MICROELECTRONICS RESEARCH AT CALTECH AND THE JET PROPULSION LABORATORY.

ATHENA GROUP INC
3424 NW 31ST ST

GAINESVILLE, FL 55481
Program Manager: GLENN S ZELNIKER
Contract #:
Title: FRONT END SIGNAL PROCESSOR
Topic #: A90-429 Office: SDC ID #: 42218

THE ABILITY TO MOVE C3 CAPABILITIES FORWARD (TOWARD THE SENSOR GROUPS) IN A DEFENSE SIGNAL AND IMAGE PROCESSING SYSTEM IS CRITICAL FOR TACTICAL AND LOGISTICAL REASONS. CURRENTLY, THE EXISTING TECH- NOLOGY BASE IS INCAPABLE OF ACHIEVING THIS FUSION DUE TO SPEED, POWER, PACKAGING, AND POWER CONFLICTS. TO ACHIEVE A FRONT-END SIGNAL PROCESSING CAPABILITY, ATHENA PROPOSES TO EXPLOIT THE ADVANTAGEDS OF A HIGHLY PARALLEL ARITHMETIC SYSTEM CALLED THE RESIDUE NUMBER SYSTEM (RNS). IN THIS AREA, ATHENA HAS PROVEN CAPABILITES AND A HISTORY OF INNOVATION. THE INNOVATION TO BE STUDIED DURING THE PHASE I PERIOD IS CALLED THE A+ TECHNOLOGY WHICH EXTENDS ATHENA CURRENT STATE OF THE RNS-ART CHOSE TECH- NOLOGY INTO A MULTIPLIER-FREE SYSTEM WHICH REQUIRES (FOR THE FIRST TIME) NO INTERNAL NUMBER SYSTEM CONVERSION. THE RESEARCH PROGRAM WILL DEVELOP THIS OPPORTUNITY AND VERIFY THE CONCEPT USING SIMULATION VIA PROGRAMMABLE GATE ARRAY DEVELOPMENT TOOLS. THE STUDY WILL QUANTIFY THE A+ SPPED, SPEED-AREA RATIO, RELIABILITY, AS WELL ULSI/WSI SENSOR INTEGRATION ADVANTAGED. THE PHASE I STUDY WILL DEVELOP A FRONT-END SIGNAL PROCESSING CAPABILITY BASED ON THE A+ TECHNOLOGY. THIS INCLUDES HIGH-DECIMATION RATE DIGITAL FILTERS (DECIMATION RATE OF 2(16) OR GREATER), SUPERIOR STEEP-SKIRT FIRs, MODULATORS/DEMODULATORS, AND HIGH-BANDWIDTH HILBERT FILTERS. ALL OF THESE OPERATIONS CAN BE FOUND AT THE SENSOR LEVEL OF A DEFENSE SIGNAL PROCESSING SYSTEM. DSP PERFORMANCE, AS WELL AS BANDWIDTH, AREA, AND POWER ESTIMATES WILL BE DERIVED FOR THE APPLICATIONS USING A+ AND CONVENTIONAL PROCESSOR TECHNOLOGIES. THE STUDY WILL PROVIDE THE FOUNDATION UPON WHICH A PHASE II PROCESSOR TECHNOLOGY WILL BE DEVELOPED IN CMOS ALONG WITH A SUPPORT INFRASTRUCTURE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02154
Program Manager: DR LAWRENCE H DOMASH
Contract #:
Title: LOW POWER OPTICAL BISTABILITY WITH CONTROLLABLE THRESHOLD
Topic #: A90-430 Office: SDC ID #: 42219

OPTICALLY BISTABLE SWITCHES ARE BASIC COMPONENTS FOR OPTICAL COMPUTING SYSTEMS. DESIRED FEATURES ARE HIGH SPEED SWITCHING (1 usec), LOW POWER THRESHOLD (<1 mW/cm[2]), ARE CASCADIBILITY. BELL LABS' SEED DEVICE OFFERS GOOD PERFORMANCE BUT IS EXPENSIVE AND COMPLES TO FABRICATE, REQUIRING MOLECULAR BEAM EPITAXY. CASCADING OF SEVERAL SEEDS, AS WOULD BE REQUIRED FOR MOST OPTICAL COMPUTING ARCHITECTURES, HAS PROVEN DIFFICULT. WE PROPOSE A NOVEL BISTABLE MECHANISM IN GaAs WHICH APPEARS TO HAVE SPEED AND POWER THRESHOLD AT LAST EQUAL TO THE SEED, SUPERIOR CASCADIBILITY THROUGH OPTICALLY PROGRAMMABLE THRESHOLD, AND IS MUCH SIMPLER AND LESS EXPENSIVE TO FABRICATE, SINCE MULTIPLE QUANTUM WELL STRUCTURES ARE NOT REQUIRED. PHASE I RESEARCH FOCUSES ON FABRICATION OF A PROTOTYPE SAMPLE AND THE FEASIBILITY OF ITS OPERATION AS WELL AS INVESTIGATING OTHER POSSIBLE MATERIALS FOR FURTHER INVESTIGATION IN PHASE II. PHASE II WORK WILL CONCENTRATE ON IMPROVEMENT OF THE SWITCHING SPEED, OPERATING POWER AND SPATIAL RESOLUTION. VARIOUS RELATED DESIGNS AND ORGANIC AND INORGANIC MATERIALS AND HETEROSTRUCTURES WILL BE INVESTIGATED. PHASE II WILL GO ON TO MAKE A 2 D ARRAY OF THE DEVICE FOR OPTICAL COMPUTING APPLICATIONS. LOW-COST ARRAYS OF SUCH BISTABLE DEVICES COULD SIGNIFICANTLY ACCELERATE PROGRESS IN OPTICAL COMPUTING.

BONNEVILLE SCIENTIFIC INC
918 E 900TH S

SALT LAKE CITY, UT 84105
Program Manager: ALLEN R GRAHN
Contract #:
Title: SELF-CONTAINED MINIATURE DEXTEROUS HAND FOR ASAT ASSEMBLY AND ON-ORBIT REPAIR
Topic #: A90-431 Office: SDC ID #: 42220

THE POTENTIAL HAZARD, EXPENSE, AND DELAYS ASSOCIATED WITH USING EVA ASTRONAUTS FOR THE MAINTENANCE OF A DEPLOYED ASAT (ANTISATELLITE) SYSTEM MAKE THIS APPROACH IMPRACTICAL. ORBITING ROBOTIC REPAIR MEN ARE CHEAPER, EXPENDABLE, FASTER, MORE ACCURATE, AND BETTER SUITED TO THE HOSTILE ENVIRONMENT OF SPACE. THIS PROPOSAL IS FOR A UNIQUE ROBOT TECHNOLOGY THAT HAS APPLICATION FOR BOTH ON-ORBIT ASAT REPAIR AND IN ROBOTIC MANUFACTURING. THE OVERALL PROJECT IS FOR THE DEVELOPMENT OF A MINIATURE DEXTEROUS HAND HAVING UNIQUE, HIGHLY EFFICIENT ACTUATORS CONTAINED WITHIN THE FINGERS. IN THIS PHASE I PROJECT, WE WILL ESTABLISH THE FEASIBILITY OF THE PROPOSED PIEZO- ELECTRIC MOTOR CONCEPT USED FOR FINGER ACTUATORS. THE DEXTEROUS HAND CONSTRUCTED IN PHASE II WILL HAVE SMALL SIZE (TO FIT INTO CONFINED SPACES), LOW MASS (TO CONSERVE ROBOT PAYLOAD), SELF-CONTAINED ACTUATORS, AND A ROBUST TACTILE SENSING CAPABILITY.

AKM ASSOC INC
635 MARINERS ISLAND BLVD - STE 205
SAN MATEO, CA 94404
Program Manager: DR ADOLPH SMITH
Contract #:
Title: CELLULAR AUTOMATA SIMULATION OF THIN FILM DIAMOND DEPOSITION PROCESS
Topic #: A90-432 Office: SDC ID #: 42221

ASAT SYSTEM REQUIREMENTS EMPHASIZE LIGHT-WEIGHT NUCLEAR-HARD AND HIGH-POWER HARDWARE AND COMPONENTS. DIAMOND TECHNOLOGY BOTH AS SINGLE-CRYSTAL BULK MATERIAL AND PLYCRYSTALLINE THIN FILMS HAVE MANY POTENTIAL APPLICATIONS FOR ASAT OFFENSIVE AND DEFENSIVE SYSTEMS. THE GOAL OF THE PROPOSED RESEARCH IS TO DEVELOP A THEORETICAL MODEL OF DIAMOND FILM DEPOSITION SO THAT THERE WILL BE A SIMULATION GUIDE FOR EXPERIMENTAL WORK. IN ADDITION, THE SIMULATIONS WILL BE ABLE TO DISTINGUISH BETWEEN PROPOSED CHEMICAL MECHANISMS, AND TO INVESTIGATE THE ROLE OF POSSIBLE MODIFICATIONS TO THE SURFACE, SUCH AS THE INTRODUCTION OF SURFACE CHARGE. THE FIRST MODEL TO BE EXAMINED DURING PHASE I OF THE PROPOSED RESEARCH IS THE CELLULAR AUTOMATA (CA) MODEL. THIS MODEL USES DISCRETE SPACE AND TIME INTERVALS. RULES FOR LOCAL INTERACTIONS ARE SELECTED AND AN INITIAL CONFIGURATION (SUCH AS A SINGLE SEED) IS USED AS A STARTING CONFIGURATION. COMPUTER SIMULATION PROCEEDS THEREAFTER AND THE RESULTING CONFIGURATIONS ARE OBSERVED. THE SECOND MODEL TO BE INVESTIGATED IN PHASE II OF THE PROPOSED RESEARCH IS THE PERCOLATION MODEL. IN PHASE II OF THE PROPOSED EFFORT, WE WILL ATTEMPT TO ASSOCIATE PARAMETERS OF THE DEPOSITION PROCESS WITH PARAMETERS OF THE PERCOLATION. IN ADDITION IN PHASE II WE WILL MODEL MORE DETAILED FEATURES OF THE FILM DEPOSITION PROCESS USING CELLULAR AUTOMATA.

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301
Program Manager: MICHAEL O'CALLAGHAN
Contract #:
Title: LASER BEAM POINTING USING DEFORMABLE HELIX FERROELECTRIC LIQUID CRYSTAL SPATIAL LIGHT MODULATORS
Topic #: A90-433 Office: SDC ID #: 42222

MECHANICAL BEAM STEERING SYSTEMS ARE LIMITED IN SPEED, COMPACTNESS, RELIABILITY, AND

ACCURACY. SIMILAR DIFFICULTIES WERE ENCOUNTERED IN THE DEVELOPMENT OF RADAR SYSTEMS. IN THE CASE OF RADAR, THE DEVELOPMENT OF PHASED ARRAY ANTENNAS ALLOWED GREATER SPEED AND FLEXIBILITY THAN WAS EVER POSSIBLE USING MECHANICALLY STEERED ANTENNAS. ELECTROOPTIC TECHNOLOGIES EXIST WHICH ARE CANDIDATES FOR REPLACING MECHANICAL LASER BEAM STEERING SYSTEMS BY THE OPTICAL EQUIVALENT OF A PHASED ARRAY ANTENNA. OPTICAL PHASED ARRAYS (OPA) USING DEFORMABLE HELIX FERROELECTRIC LIQUID CRYSTAL (DHFLC) PHASE MODULATORS ARE LEADING CANDIDATES FOR ADVANCED BEAM STEERING APPLICATIONS. ADVANTAGES OF THIS TECHNOLOGY INCLUDE CONTINUOUSLY ADJUSTABLE 0-2 pi PHASE MODULATION, LOW POWER REQUIREMENTS AND DRIVING VOLTAGES (~2 V), AND HIGH SPEED (~10 us). OPTICAL PHASED ARRAYS HAVE THE ADVANTAGE THAT THEIR POINTING ACCURACY CAN BE IMPROVED JUST BY INCREASING THE NUMBER OF PIXELS IN AN ARRAY. THE GOAL OF THE PROPOSED WORK ARE TO PERFORM AN EXPERIMENTAL DEMONSTRATION OF THE PRINCIPLES BEHIND THE DEFORMABLE HELIX FLC BEAM POINTING ARRAY, FURTHER DEVELOP OUR ABILITY TO FABRICATE SUCH MATERIALS AND ARRAYS, PERFORM PRELIMINARY CONCEPTUAL DESIGNS OF MORE ADVANCED BEAM STEERING ARRAYS, AND DEVELOP PRELIMINARY DESIGNS FOR HIGH SPEED DRIVE ELECTRONICS.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
Program Manager: ROBERT D CHAPMAN
Contract #:
Title: PROPULSION AND PROPELLANTS FOR ANTI-SATELLITE (ASAT)
Topic #: A90-434 Office: SDC ID #: 42223

NEW OXIDIZERS OFFER THE GREATEST POTENTIAL FOR ACHIEVING IMPULSE GOALS IN ADVANCED PROPELLANTS SUCH AS ARE REQUIRED BY KINETIC ENERGY WEAPONS IN ANTI-SATELLITE DEFENSE SYSTEMS. THE MAIN OBJECTIVE OF THIS PROGRAM IS TO SYNTHESIZE THE POTENTIAL ADVANCED OXIDIZER 1,3-DINITRO-1,3-DIAZETIDINE. THIS OXYGEN-BALANCED NITRAMINE WITH INTRINSIC STRAIN ENERGY IS PREDICTED TO BE A PROPELLANT INGREDIENT SIGNIFICANTLY SUPERIOR EVEN TO CURRENT ADVANCED INGREDIENTS SUCH AS 1,3,3-TRINITROAZETIDINE (TNAZ) AND CL-20. A FORMULATED PROPELLANT CONSISTING OF 80% OXIDIZER, 15% BTTN PLASTICIZER, AND 5% PGN BINDER HAS BEEN CALCULATED TO PROVIDE AN I(SP) OF 269.9 SEC FOR CL-20 COMPARED TO 279.3 SEC USING 1,3-DINITRO-1,3-DIAZETIDINE. TWO PROPOSED APPROACHES LEADING TO 1,3-DINITRO-1,3-DIAZETIDINE WILL BE EXPLORED.

ANDROMEDA CORP
8302 WHITESBURG DR - STE B
HUNTSVILLE, AL 35802
Program Manager: ROBERT E HOWLE
Contract #:
Title: SHORT PULSE WAVEFORM GENERATOR (WFG) FOR ASAT LASER RADAR APPLICATIONS
Topic #: A90-435 Office: SDC ID #: 42224

TO CREATE A DOPPLER IMAGER OF A TARGET, SUCH AS A SATELLITE, WITH A LASER RADAR, IT IS NECESSARY TO HAVE A LASER CAPABLE OF CREATING A SUITABLE. DOPPLER IMAGE RESOLUTION IS DIRECTLY RELATED TO THE LENGTH OF THE LASER PULSE (THE AMOUNT OF THE TARGET ILLUMINATED IN AN INSTANT OF TIME), AND THE REQUIRED SPACING BETWEEN PULSES IS RELATED TO THE MAXIMUM TARGET SIZE. THIS PROPOSAL ADDRESSES A METHOD OF DESIGNING A CO2 LASER CAVITY WHICH IS BELIEVED WILL GENERATE ULTRA-SHORT OPTICAL PULSES (TENTHS OF A NANOSECOND) SPACED TENS OF NANOSECONDS APART. A COMBINATION OF PROVEN OPTICAL TECHNQIUES SHOULD ALLOW PRODUCTION OF SUB-NANOSECOND CO2 LASER PULSES SUITABLE FOR HETERODYNE DETECTION IN STATE-OF-THE-ART ASAT LASER RADAR APPLICATIONS. THIS WAVEFORM GENERATOR (WFG) WILL BE USED AS INPUT TO A LONG PULSE LASER AMPLIFIER (LPLA) ALREADY UNDER DEVELOPMENT TO PRODUCE HIGH ENERGY

OPTICAL PULSES FOR ASAT RELATED APPLICATIONS.

INTELLIGENT AUTOMATION INC
1370 PICCARD DR - STE 210
ROCKVILLE, MD 20850
Program Manager: LEONARD S HAYNES
Contract #:
Title: SIX DEGREE OF FREEDOM ACTIVE VIBRATION DAMPING FOR SPACE APPLICATIONS
Topic #: A90-436 Office: SDC ID #: 42225

INTELLIGENT AUTOMATION, INCORPORATED HAS SPENT TWO YEARS INVESTIGATING AND THEN SIMULATING CONTROL OF A HIGH SPEED, HIGH PRECISION, SIX DEGREE OF FREEDOM MOTION STAGE BASED ON A SIX LEGGED PARALLEL LINK MANIPULATOR. OUR SYSTEM EXPLOITS SIX MAGNETOSTRICTIVE ACTUATORS, ONE IN SERIES WITH EACH CONVENTIONAL LEG ACTUATOR. THIS ALLOWS THE CONVENTIONAL ACTUATORS TO PROVIDE SIX DEGREE OF FREEDOM POSITIONING WHILE THE SIX MAGNETOSTRICTIVE ACTUATORS (WHICH ELONGAGE UNDER THE INFLUENCE OF A MAGNETIC FIELD) PROVIDE AN ADDITIONAL SIX DEGREES OF FREEDOM HIGH FREQUENCY VIBRATION ISOLATION. MAGNETOSTRICTIVE ELEMENTS ARE EXTREMELY LIGHT AND CAN EXERT LARGE FORCES AT HIGH FREQUENCIES. THE SIX LEGGED PARALLEL LINK MECHANISM, CALLED A STEWART PLATFORM, PROVIDES A MEANS TO CONVERT THIS ONE DIMENSIONAL DISPLACEMENT INTO SIX DIMENSIONAL, HIGH FREQUENCY, HIGH PRECISION MOTION. IN SPACE STRUCTURES, THE VIBRATIONAL FORCES WILL INCLUDE FLEXING AND TWISTING, AND WE BELIEVE THAT SIX AXIS COUNTER MOTION IS ESSENTIAL TO IMPLEMENTING HIGH PERFORMANCE ACTIVE VIBRATOR ISOLATION AND DAMPING. THE SYSTEM WE PROPOSE WILL MEET THIS REQUIREMENT.

SCIENCE RESEARCH LAB INC
15 WARD ST
SOMERVILLE, MA 02143
Program Manager: DR JONAH JACOB
Contract #:
Title: EXPANDING BEAM LASER AMPLIFIER AS A COST EFFECTIVE ARCHITECTURE FOR ASAT
Topic #: A90-437 Office: SDC ID #: 42226

THE EXPANDING BEAM LASER (EBL) AMPLIFIER CONCEPT IS PRESENTED AS A METHOD FOR EFFICIENT SCALING OF VARIOUS LASERS TO THE HIGH AVERAGE POWER LEVELS REQUIRED FOR ASAT APPLICATIONS. THE EBL AMPLIFIER CONCEPT INCREASES THE STAGE GAIN WHICH CAN BE EFFICIENTLY OBTAINED FROM A POWER AMPLIFIER BY FACTOS OF 10-30 SO THAT INTERMEDIATE AMPLIFIERS CAN BE ELIMINATED IN THE MOPA CHAIN. SUCH SIMPLIFICATION OF THE SYSTEM ARCHITECTURE RESULTS IN A SIGNIFICANT COST SAVINGS AND INCREASED RELIABILITY. ADDITIONAL ADVANTAGES INCLUDE REDUCE BEAM QUALITY SENSITIVITY TO LASER MEDIUM INHOMOGENEITIES, A SIMPLIFIED OPTICAL SYSTEM AND REDUCED LEVELS OF AMPLIFIED SPONTANEOUS EMISSION. TO ILLUSTRATE THE ADVANTAGES OF THIS ARCHIETECTURE, SRL HAS INVESTIGATED THE BENEFITS OF THE EBL FOR LARGE GROUND BASED RARE GAS HALIDE LASERS AND SMALLER CO2 LASERS. THE ADVANTAGES OF THE EBL AMPLIFIER LEAD TO A REDUCTION IN COST FOR HIGH AVERAGE POWER RARE GAS HALIDE LASER SYSTEMS OF A FACTOR OF 3 AND HAVE THE POTENTIAL TO MAKE THESE LASERS COST COMPETITIVE WITH OTHER GROUND BASED LASER (GBL) ASAT APPROACHES. IN PHASE I A DETAILED PROOF-OF-PRINCIPAL EXPERIMENT WILL BE DESIGNED. THE DESIGN WILL BE ACCOMPLISHED BY OBTAINING DATA OF THE RELEVANT LASER PARAMETERS ON AN EXISTING EXCIMER LASER FACILITY DURING PHASE I. THE EXPANDING BEAM AMPLIFIER WILL BE EXPERIMENTALLY VERIFIED IN PHASE II OF THIS SBIR.

IMPACT TECHNOLOGIES INC
4540 JOHN MARR DR

AD-A240 987 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM 1/3
(SBIR) VOLUME 1 ARMY ABSTRACTS OF PHASE 1 AWARDS 1990
(U) DEPARTMENT OF DEFENSE WASHINGTON DC 1990 XD-DA

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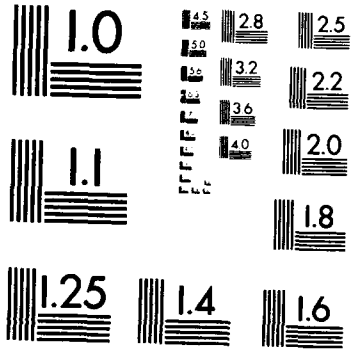

ANNANDALE, VA 22003
Program Manager: CARL W ANDERSON
Contract #:
Title: RADIAL BLEED THRUST CONTROL SYSTEM RESEARCH FOR KEW
Topic #: A90-439 Office: SDC ID #: 42227

THE DEFENSE AGAINST SATELLITES REQUIRES EFFICIENT, HIGHLY MANEUVERABLE KINETIC ENERGY INTERCEPTORS THAT CAN BE LAUNCHED FROM GROUND, AIR, OR SPACE-BASED PLATFORMS. THE LOGICAL PROPULSION SYSTEMS FOR THESE INTERCEPTORS, BASED ON THEIR HIGH ENERGY DENSITY, LONG TERM STORABILITY, AND MECHANICAL SIMPLICITY, ARE SOLID PROPELLANT ROCKET MOTORS (SRM'S). YET, SRM'S HAVE ALWAYS BEEN PENALIZED, RELATIVE TO COMPETING SYSTEMS, FOR THEIR INABILITY TO PROVIDE COMPLETE ACTIVE CONTROL OF THE MOTOR THRUST. THE SUBJECT INNOVATION OFFERS AN ULTRA-ADVANCED RADIAL BLEED NOZZLE SYSTEM THAT REMOVES THESE LIMITATIONS BY PROVIDING FOR ACTIVE MEANS OF SRM TOTAL THRUST CONTROL. THE RADIAL BLEED CONCEPT IS AN EMERGING NEW SOLID PROPULSION CONTROL TECHNOLOGY WHEREIN CHAMBER GAS IS "BLED-OFF" FROM A SOLID PROPELLANT CHAMBER (MOTOR OR GAS GENERATOR) USING SMALL, RADIALLY-DIRECTED THRUSTERS (4-12 PER UNIT). THESE THRUSTERS ARE COMPUTER-CONTROLLED, AND WORK TOGETHER TO PROVIDE THE REQUIRED CONTROL FORCES (AND MOMENTS) TO THE MISSILE BODY. THESE THRUSTERS RAPIDLY THROTTLE THE FLOW USING TWO-POSITION, "ON-OFF", HIGH-SPEED, ALL-ELECTRIC ACTUATORS. THESE ACTUATORS ARE EXTREMELY FAST, SMALL, ECONOMICAL, AND UNLIKE NO OTHERS EVER USED IN SRM HISTORY. THE RADIAL BLEED THRUSTERS CAN BE POSITIONED, SIZED, AND CONFIGURED IN ANY MANNER TO PROVIDE SPECIFIC MISSILE CONTROL SYSTEM NEEDS.

PHOTON RESEARCH ASSOCS INC
9393 TOWNE CENTRE DR - STE 200
SAN DIEGO, CA 92121
Program Manager: WILLIAM M CORNETTE
Contract #:
Title: DEVELOPMENT OF A MODERN STANDARD ATMOSPHERE MODEL FOR KWAJALEIN ATOLL ENVIRONS
Topic #: A90-440 Office: SDC ID #: 42228

PRA PROPOSES TO DEVELOP AN EFFICIENT, FLEXIBLE SOFTWARE PACKAGE FOR DESCRIBING A MODERN STANDARD ATMOSPHERE MODEL FOR THE ENVIRONS SURROUNDING THE KWAJALEIN ATOLL. THE PRIMARY EMPHASIS OF THIS MODEL WILL BE TO PROVIDE PROPAGATION PARAMETERS TO CORRECT RADAR MEASURE- MENTS, BOTH IN A REAL TIME MODE AND FOR POST-MISSION ANALYSIS. PRIMARY EMPHASIS WILL BE PLACED ON TROPOSPHERIC EFFECTS ON RADAR PROPAGATION, ALTHOUGH THE MODEL WILL BE ROBUST ENOUGH FOR GROWTH INTO THE MILLIMETER WAVE AND INFRARED. THE MODEL WILL BE BASED UPON A COMBINATION OF HISTORICAL METEROLOGICAL DATA, AS WELL AS REAL (OR NEAR-REAL) TIME METEOROLOGICAL DATA AVAILABLE FROM A VARIETY OF METEOROLOGICAL SYSTEMS, INCLUDING THE METEOROLOGICAL SOUNDING SYSTEM (MSS) SONDE, SATELLITE OBSERVATIONS, AND MMW SPACE-AVERAGED SURFACE MEASUREMENTS AVAILABLE AT THE KWAJALEIN ATOLL.

McDANIEL J L ENTERPRISES INC
128 JETPLEX CIR
MADISON, AL 35758
Program Manager: HENRY A CORRIHER
Contract #:
Title: SPLASH DETECTION AND SURVEILLANCE RADAR
Topic #: A90-441 Office: SDC ID #: 42229

THE PRINCIPAL OBJECTIVE FOR THIS PHASE I SBIR PROGRAM IS THE DEFINITION OF A CONCEPT FOR AN INNOVATIVE, LOW COST RADAR SYSTEM CAPABLE OF THE DETECTION OF OCEAN SPLASHES CREATED BY

THE IMPACT OF REENTRY VEHICLES AS WELL AS THE SURVEILLANCE OF AIRCRAFT AND SHIPS IN THE KWAJALEIN MISSILE RANGE (KMR). IT WILL TAKE ADVANTAGE OF PREVIOUS THEORETICAL AND EXPERIMENTAL STUDIES OF RADARS FOR SPLASH LOCATION, PERISCOPE/SNORKEL DETECTION, AND SMALL BOAT DETECTION. WHILE PHYSICAL PRINCIPLES OF EARLIER RADARS FOR DETECTION OF SMALL TARGETS ON THE SURFACE OF THE SEA HAVE NOT CHANGED, TECHNOLOGICAL ADVANCES HAVE MADE LOWER COST IMPLEMENTATION OF SUCH RADARS MORE PRACTICAL. THE FOLLOWING MAJOR TECHNOLOGIES HAVE ADVANCED RECENTLY AND ARE PERTINENT TO UPDATING THESE RADAR CONCEPTS: RAPID-SCAN, STABLIZED ANTENNAS; SOLID STATE ELECTRONICS; LOW-NOISE RECEIVERS FOR X-, Ku, AND Ka-BANDS; DIGITAL SIGNAL PROCESSING; VIDEO RECORDING; SATELLITE NAVIGATION AND COMMUNICATIONS SYSTEMS; AND COMPUTERIZED DATA REDUCTION. THE PROBLEM WILL BE CONSIDERED FROM THE STANDPOINTS OF BOTH GENERIC SMALL-TARGET CLASSES AND SPECIFIC CURRENT AND POTENTIAL FUTURE TARGETS. IN PARTICULAR, THESE WILL INCLUDE SPLASHES PRODUCED BY INTACT OR FRAGMENTED REENTRY OBJECTS AND SURFACE TARGETS HAVING SMALL TO MEDIUM (E.G., 1 TO 100 SQUARE METERS) EFFECTIVE RADAR CROSS-SECTIONS. EARLIER APPROACHES WILL BE UPDATED AND EXTENDED, WITH PARTICULAR ATTENTION TO LOW COST RAPID-SCAN RADARS FOR SHIPS OR AIRCRAFT PLATFORMS. ONE OR MORE OF THE MOST PROMISING CONCEPTS WILL BE MODELED FOR BASIC ANALYSIS, AND PRELIMINARY SYSTEMS PARAMETERS WILL BE SPECIFIED SO THAT A TECHNICALLY FEASIBLE RADAR CONCEPT MAY BE DEFINED THAT MEETS THE KWAJALEIN MISSILE RANGE SPLASH DETECTION AND SURVEILLANCE NEEDS.

FLAM & RUSSELL INC
PO BOX 999 - 506 PRUDENTIAL RD
HORSHAM, PA 19044
Program Manager: JOHN F AUBIN
Contract #:
Title: AN/FPQ RADAR AUTOMATED PHASE TRACKING RECEIVER UPGRADE
Topic #: A90-442 Office: SDC ID #: 42230

MANY GOVERNMENT WEAPONS TESTING FACILITIES SUCH AS THE KWAJALEIN MISSILE RANGE DEPEND ON C BAND TRACKING RADARS SUCH AS THE AN/FPQ-19 TO PROVIDE ANGLE TRACKING AND RANGE DATA DURING MISSILE TESTS. THESE TYPES OF RADARS ARE STILL THE PRIMARY INSTRUMENTS USED FOR TEST SUPPORT, ALTHOUGH THE STATE OF THE ART HAS ADVANCED SINCE THESE RADARS WERE FIELDED. ONE LIMITATION OF THESE RADARS IS A CUMBERSOME TUNING AND CALIBRATION PROCEDURE WHEN THE FREQUENCY IS CHANGED MORE THAN 50 MHz. THE LOCAL OSCILLATOR (LO) IS MECHANICALLY RETUNRED UNTIL THE AFC LOCKS ON, AND THE THREE RECEIVER CHANNELS ARE MANUALLY PHASE COMPENSATED. IN ORDER TO AVOID RECALIBRATION, TEST MISSILE BEACON TRANSPONDER FREQUENCIES HAVE TO BE LIMITED TO A 50 MHz BAND SEGMENT. THE RADAR MAY BE UPGRADED BY AUTOMATING THESE ADJUSTMENTS SO THAT THE OPERATOR MAY TUNE THE RADAR RECEIVER FREQUENCY BY ADJUSTING A SINGLE CONTROL. THIS PROPOSAL DESCRIBES THE DESIGN AND PROCEDURE TO IMPLEMENT SUCH AN UPGRADE. THE PROPOSED IMPROVEMENT ENTAILS REPLACING THE RECEIVER LOCAL OSCILLATOR WITH A SOURCE THAT IS EASILY TUNED, AND PROVIDES DATA INDICATING THE TUNED FREQUENCY. A PROCESSOR SUBSYSTEM READS THE FREQUENCY DATA AND AUTOMATICALLY CONTROLS 360 DEGREE PHASE SHIFTERS THAT REPLACE THE MANUAL PHASE SHIFTERS IN THE RECEIVER.

FLIGHT MECHANICS & CONTROL INC
47 E QUEEN'S WY - STE 204
HAMPTON, VA 23669
Program Manager: JOHN T FINDLAY
Contract #:
Title: AN ASSESSMENT OF THE BEST ESTIMATE TRAJECTORY (BET) GENERATION METHODOLOGY UTILIZED AT THE KWAJALEIN MISSILE RANGE
Topic #: A90-443 Office: SDC ID #: 42231

THE PHASE I SBIR PROPOSAL INCLUDED HEREIN ADDRESSES THE TOPIC NUMBER A90-443, ENTITLED TRAJECTORY ESTIMATION OF PROGRAM SOLICITATION 90.2. THE MAIN OBJECTIVE OF THIS PROPOSED EFFORT IS TO PROVIDE A MORE REALISTIC ASSESSMENT OF THE AERODYNAMIC FORCES ACTING ON AN ATMOSPHERIC REENTRY VEHICLE FLOWN FROM THE U.S. WEST COAST TO THE KWAJALEIN MISSILE RANGE (KMR). THE EFFECTS OF THESE FORCES ARE TO BE INCLUDED IN THE POST-FLIGHT BEST ESTIMATE TRAJECTORY (BET) GENERATION PROCESS BY UTILIZING DATA AVAILABLE FROM ON-BOARD SENSORS AND EXTERNAL TRACKING SITES. A DETAILED WORK PLAN IS PRESENTED IN THIS PROPOSAL SUCH THAT RECOMMENDED MODIFICATIONS TO THE KMR BET METHODOLOGY CAN BE MADE TO MEET THE OBJECTIVES OF THE PROBLEM. THE TECHNICAL APPROACH FOR THE PROPOSED EFFORT CONSISTS OF AN EXTENSIVE SURVEY OF THE CURRENT KMR BET PROCESS, A COMPARISON OF THIS PROCESS TO OTHER BET METHODOLOGIES, PRELIMINARY DEFINTITIONS FOR MODIFICATIONS, AND, FINALLY RECOMMENDATIONS FOR FURTHER DEVELOPMENT TO THE KMR BET SCHEME. RESULTS FROM THIS PHASE I STUDY WILL PROVIDE CONCEPTS, AND DEMONSTRATE THE FEASIBILITY OF THESE CONCEPTS, IN ORDER TO MEET THE KMR BET REQUIREMENTS; PROVIDE SUPPORTING DATA TO EVALUATE EXISTING KMR ATMOSPHERIC MODELS AND/OR SUPPORT DEVELOPMENT OF SAME; AND DETERMINE THE SOURCE OF AND CORRECT ANY ERRORS IN THE CURRENT TRAJECTORY FITTING PROCESS.

AEROMET INC
PO BOX 701767
TULSA, OK 74170
Program Manager: DAVID H BROWN
Contract #:
Title: RADIO FREQUENCY HAZARD MONITORING - USAKA
Topic #: A90-444 Office: SDC ID #: 42232

AEROMET PROPOSES TO DEVELOP A SENSOR SYSTEM FOR THE PURPOSE OF MONITORING RF FIELD STRENGTH ENERGY. PHASE I WILL CONCENTRATE ON THE DESIGN AND DEVELOPMENT OF A UNIQUE PROGRAMMABLE SENSOR THAT CAN SENSE THE ENERGY IN VARIOUS FREQUENCY BANDS. THE SENSOR WILL ACT AS A STAND ALONE UNIT AND BE POWERED BY SOLAR CHARGED BATTERIES. THE SENSOR WILL BE DESIGNED SO THAT MANY OF THEM CAN BE OPERATED IN CONJUNCTION WITH A COMMON "CONTROL CENTER" WHICH WILL BE USED TO COLLECT, DISPLAY AND ARCHIEVE THE DATA. COMMUNICATION BETWEEN SENSOR UNITS AND THE CONTROL CENTER COULD USE TELEPHONE LINES OR A VHF RADIO LINK.

SPECTRUM MATERIALS INC
3010-E BUSINESS PARK DR
NORCROSS, GA 30071
Program Manager: JAMES McSHEEHY
Contract #:
Title: AUTONOMOUS DISTRIBUTED RF POWER MONITOR CONCEPTS
Topic #: A90-445 Office: SDC ID #: 42233

THE CONCEPT FOR AN AUTONOMOUS, DISTRIBUTED RF POWER MONITOR SYSTEM IS DESCRIBED. THE SYSTEM IS CAPABLE OF MONITORING RF POWER LEVELS OVER A FREQUENCY RANGE OF 300 kHz TO 100 GHz. AUTOMATIC OPERATION AND HARDWARE REDUNDANCY ENABLE THE SYSTEM TO CONTINUE OPERATION EVEN IF SOME ELEMENTS FAIL OR ARE REMOVED FOR MAINTENANCE. THE SYSTEM CONCEPT IS ADAPABLE TO REMOTE AREAS AND REQUIRES NO DEDICATED POWER SOURCES OR COMMUNICATIONS LINES.

SIGMATECH INC
200 SPARKMAN DR
HUNTSVILLE, AL 35805

Program Manager: CHARLES JOHNSON
Contract #:
Title. DEVELOPMENT OF ENHANCEMENT TO DATA COLLECTION CAPABILITIES OF KWAJALEIN MISSILE RANGE SYSTEMS
Topic #: A90-446 Office: SDC ID #: 42234

THE DATA COLLECTION FOR THE MILLIMETER WAVELENGTH INSTRUMENTATION RADAR, BASED ON THE KWAJALEIN ATOLL, COULD BE SIGNIFICANTLY ENHANCED IF THE RADAR IS MODIFIED TO PROVIDE A LIMITED FIELD OF VIEW (LFOV) CAPABILITY. THIS WOULD ALLOW THE RADAR TO HAVE THE SAME CAPABILITY AS A FULL PHASED ARRAY OVER A LIMITED ANGLE COVERAGE WHICH WOULD MEAN MORE THAN ONE TARGET COULD BE TRACKED AT A TIME. THE APPROACH WOULD BE TO REPLACE THE EXISTING SOLID SUB-REFLECTOR WITH A SMALL PHASED ARRAY. THIS COULD BE DONE WITHOUT ESSENTIALLY CHANGING THE PRESENT RADAR CHARACTERISTICS.

SPACE SYSTEMS ANALYSIS INC
2901 N INTERREGIONAL - STE 304
AUSTIN, TX 78722
Program Manager: DR C K SHUM
Contract #:
Title: TRAJECTORY FIT ANALYSIS AND PRECISE DETERMINATION OF BALLISTIC TRAJECTORY
Topic #: A90-447 Office: SDC ID #: 42235

THE PROPOSED INVESTIGATION WILL PERFORM AN ELABORATE ERROR ANALYSIS AND WILL DEVELOP APPROPRIATE FORCE AND MEASUREMENT MODELS TO PRECISELY DETERMINE THE VANDENBERG-KWAJALEIN BALLISTIC MISSILE TRAJECTORY. AMONG THE ERROR SOURCES CONSIDERED WILL INCLUDE (1) STATION COORDINATE ERRORS FOR THE THREE TRACKING STATIONS LOCATED AT VANDENBERG, HAWAII AND KWAJALEIN; (2) GRAVITY ANOMALY MODEL ERRORS AT LAUNCH SITE, IN MID-TRAJECTORY, AND AT IMPACT AREAS; (3) ATMO- SPHERIC AND AERODYNAMIC MODEL ERRORS DURING LAUNCH AND DURING REENTRY; AND (4) MEASUREMENT MODEL ERRORS ASSOCIATED WITH RADAR INSTRUMENTS, INCLUDING ALTAIR, TRADEX, ALCOR AND MMW; AND ON-BOARD SENSORS, SICH AS RATE GYRO AND ACCELEROMETER. THIS INVESTIGATION WILL DEALT PRIMARILY WITH THE GRAVITY ANOMALY MODEL ERRORS AND THE MEASUREMENT MODEL ERRORS AFFECTING THE BALLISTIC TRAJECTORY. THE SOFTWARE TOOLS TO BE USED INCLUDE THE TRAJECTORY ANALYSIS PROGRAM (TRAP) WHICH WAS DEVELOPED AT THE UNIVERSITY OF TEXAS AT AUSTIN AND IS ALSO OPERATIONAL AT SANDIA NATIONAL LABORATORY. HOWEVER, TRAP HAS LIMITATIONS IN SOME OF MODELINGS NEEDED TO PERFORM THE PROPOSED INVESTIGATION. IF NECESSARY, THE UNIVERSITY OF TEXAS ORBIT PROCESSOR (UTOPIA) WILL ALSO BE USED IN PROVIDING TRAJECTORY ANALYSIS TO IDENTIFY SOME OF THE ERROR SOURCES. STATE-OF-THE-ART GRAVITY MODELS, INCLUDING THE UNIVERSITY OF TEXAS GEOPOTENTIAL (TEG-2), WGS-84 AND THE OHIO STATE UNIVERSITY FIELD OSU89B WILL BE USED TO CHOOSE THE BEST MODEL FOR THE PROBLEM. TRACKING STATION COORDINATES WILL BE ESTIMATED RELATIVE TO THE TERRESTRIAL REFERENCE SYSTEM DETERMINED BY SATELLITE LASER RANGING TO LAGEOS (ACCURATE TO WITHIN 5 cm) TO ASSESS ITS EFFECT ON THE BALLISTIC TRAJECTORY. IT IN ENVISIONED THAT PHASE I WORK WILL PRODUCE A DETAILED ERROR ANALYSIS AND PHASE II AND PHASE III TASKS WILL PERFORM THE APPROPRIATE MODELING AND SOFTWARE DEVELOPMENT. THE EVENTUAL OBJECTIVE IS PROVIDE SOFTWARE TOOLS AND ANALYTICAL MEANS TO PRECISELY DETERMINE BALLISTIC TRAJECTORIES TO WITHIN SEVERAL METERS OF ACCURACY (ROOT-MEAN- SQUARED).

XONTECH INC
6862 HAYVENHURST AVE
VAN NUYS, CA 91406
Program Manager: STAN COTTRILL
Contract #:
Title: STATISTICAL DATA FOR ORBITAL DEBRIS: A MMWIR CONCEPT FEASIBILITY ASSESSMENT

Topic #: A90-448 Office: SDC ID #: 42236

SPACE VEHICLES, PARTICULARLY LONG DURATION EARTH ORBITING MISSIONS SUCH AS SPACE STATION, ARE VULNERABLE TO HYPERVELOCITY IMPACTS FROM SPACE DEBRIS. THE SPACE DEBRIS POPULATION IS INCREASING STEADILY AND IT IS IMPORTANT TO MODEL THE ENVIRONMENT TO INSURE THAT THE RISK OF IMPACE WITH SPACE VEHICLES FALLS WITHIN ACCEPTABLE LIMITS. SINCE PREDICTIONS OF THE FUTURE ORBITAL DEBRIS ENVIRONMENT ARE BASED, IN PART, ON THE CURRENT POPULATION. IT IS IMPORTANT TO MAKE MEASURE- MENTS TO RELIABLY ESTIMATE THIS POPULATION. THE MILLIMETER WAVE IMAGING RADAR (MMWIR) HAS THE POTENTIAL FOR PROVIDING DATA TO STATISTICALLY CHARACTERIZE THE DEBRIS POPULATION. XON-TECH PROPOSES TO CONDUCT A STUDY TO DEVELOP CONCEPTS FOR MODIFYING THE MMWIR TO COLLECT ORBITAL DEBRIS DATA. THE OBJECTIVES OF THIS STUDY ARE: 1) DEFINE REQUIREMENTS FOR SMALL OBJECT ORBITAL DEBRIS COLLECTION, 2) EVALUATE CURRENT AND PLANNED MMWIR CAPABILITY TO MEET THESE REQUIREMENTS, 3) EXAMINE ALTERNATIVE FOR MMWIR HARDWARE AND SOFTWARE MODIFICATIONS, AS WELL AS REAL-TIME DATA PROCESSING AND RECORDING REQUIREMENTS AND CONCEPTS FOR POST-MISSION ANALYSIS. 4) EVALUATE THE RELATIVE MERIT AND FEASIBILITY OF IMPLEMENTATION OF EACH ALTERNATIVE AND PROVIDE THE RATIONAL AND DATA BASE NECESSARY FOR DEVELOPING UPGRADE SPECIFICATIONS DURING THE PHASE II STUDY.

SPACE TECH CORP
125 CRESTRIDGE DR
FORT COLLINS, CO 80525
Program Manager: DR MICHAEL ANDREWS
Contract #:
Title: SIGNAL PROCESSING ENHANCEMENTS FOR GBR-X RADAR
Topic #: A90-449 Office: SDC ID #: 42237

IN ANY RADAR EMPLOYING AN ARRAY RECEIVING ANTENNA, SIGNALS FROM A NUMBER OF ANTENNA ELEMENTS ARE APPROPRIATELY WEIGHTED AND COMBINED TO FORM VARIOUS ANTENNA BEAM OUTPUTS. DIGITAM BEAMFORMING (DBF) DENOTES THE FORMATION OF THESE BEAM OUTPUTS BY DIGITAL COMPUTER. THE ELEMENTAL SIGNALS ARE SAMPLED AND DIGITIZED, THEN WEIGHTED AND COMBINED AS "NUMBERS" IN THE COMPUTER. THE STREAM OF NUMBERS THUS FORMED PRESENTS THE SIGNAL THAT IS SEEN BY A GIVEN ANTENNA BEAM. CHANGING THE WEIGHTS APPLIED TO THE DIGITIZED SAMPLES CHANGES THE DIRECTION AND/OR SHAPE. WAVE NUMBERS CONSTITUTE A CRITICAL PROCESSING PARAMETER. SPACE TECH CORPORATION PROPOSES TO DEVELOP ANALOG "PRE-PROCESSING" ELEMENTS JUST PRIOR TO THE A/D CONVERSION. UTILIZATION OF UNIQUE CONVERSION PROPERTIES OF SIGNED-DIGIT NUMBER SYSTEMS AND INHERENTLY FAST ALU'S WILL GREATLY ENHANCE BANDWIDTH.

SRS TECHNOLOGIES
990 EXPLORER BLVD - CUMMINGS RSCH PK W
HUNTSVILLE, AL 35806
Program Manager: RICHARD K STEINBERG
Contract #:
Title: DISPLAY DEVELOPMENT FOR USAKA MISSION DATA
Topic #: A90-450 Office: SDC ID #: 42238

SRS TECHNOLOGIES HAS FORMULATED INNOVATIVE DISPLAY CONCEPTS IN ORDER TO SIGNIFICANTLY INCREASE THE AMOUNT OF USAKA MISSION DATA DISPLAYED FROM THE GBR-X AND KREMS RADARS WHILE AT THE SAME TIME IMPROVING THE DATA INTERFACE BETWEEN TEST PERSONNEL AND DISPLAY HARDWARE. SRS'S CONCEPTS ARE IN RESPONSE TO THE PROJECTION THAT THE GBR-X PHASED ARRAY RADAR CAN HANDLE A FEW DOZEN OBJECTS SIMULTANEOUSLY. REAL-TIME DISPLAY OF MULTIPLE-OBJECT TRACK INFORMATION REQUIRES INNOVATIVE GRAPHICAL CONCEPTS THAT WILL PRESENT LARGE

QUANTITIES OF DATA IN A CONCISE, UNAMBIGUOUS MANNER. MAJOR DISPLAY FEATURES INCLUDE THE CORRELATION OF VISUAL CUES WITH DECISION AIDES, THE USE OF THREE DIMENSIONS AND A SELECTION OF DISPLAY LEVELS. THESE CONCEPTS PERMIT MAXIMUM INTUITIVE PROCESSING.

KLEIN ASSOCS INC
PO BOX 264
YELLOW SPRINGS, OH 45387
Program Manager: CAROLINE E ZSAMBOK
Contract #:
Title: APPLICATION OF AN EXPERTISE-CENTERED TAXONOMY TO TRAINING DECISIONS
Topic #: A90-451 Office: ARI ID #: 42239

THE PROBLEM IS THAT WHEN ARMY TRAINEES REACH THEIR UNITS THEY HAVE FORGOTTEN MUCH OF THE MATERIALS PRESENTED AT THEIR SCHOOLS. THE NEED IS TO IDENTIFY THE TYPES OF SKILLS AND METHODS THAT ARE MOST LIKELY TO RESULT IN ROBUST INSTRUCTION, TO PROVIDE A FIRM BASIS FOR ON-THE-JOB-TRAINING (OJT) AT THE UNIT LEVEL. THE APPROACH IS TO USE AN EXPERTISE-CENTERED SKILL TAXONOMY TO DISTINGUISH PROCEDURAL FROM TACIT KNOWLEDGE, AND TO LINK THIS TAXONOMY TO TRAINING METHODS THAT ARE EFFECTIVE FOR DIFFERENT SKILL CATEGORIES. A CRITICAL DECISION METHOD WILL BE USED TO ELICIT SUBTLE ASPECTS OF EXPERTISE OFTEN OVERLOOKED BY CONVENTIONAL TASK ANALYSES. THE OUTPUT WILL BE A SKILL TAXONOMY DIRECTLY TIED TO ARMY TRAINING REQUIREMENTS, AND A SET OF GUIDELINES FOR TRAINING TAXONOMY ELEMENTS. PHASE II WILL VALIDATE THE TAXONOMY AND GUIDELINES USING A LIMITED DEMONSTRATION WITH SELECTED ARMY TASKS.

KLEIN ASSOCS INC
PO BOX 264 - 800 LIVERMORE ST
YELLOW SPRINGS, OH 45387
Program Manager: GARY A KLEIN
Contract #:
Title: KNOWLEDGE ELICITATION STRATEGIES FOR MODELING INSTRUCTIONAL EXPERTISE
Topic #: A90-452 Office: ARI ID #: 42240

THE INTRODUCTION OF ARTIFICIAL INTELLIGENCE INTO COMPUTER-BASED INSTRUCTION (CBI) PROMISED THE POSSIBILITY OF SOPHISTICATED SYSTEMS THAT COULD PROVIDE ONE-ON-ONE INSTRUCTION EFFICIENTLY AND ECONOMICALLY. UNFORTUNATELY, EFFORTS TO DEVELOP SYSTEMS THAT REPRESENT INSTRUCTIONAL EXPERTISE HAVE BEEN LARGELY DISAPPOINTING. WHETHER DUE TO THE LACK OF WELL-DEVELOPED MODELS OF INSTRUCTIONAL EXPERTISE, OR THE DIFFICULTY OF EXTRACTING KEY COMPONENTS OF THAT EXPERTISE FROM SKILLED HUMAN INSTRUCTOR, PRESENT SYSTEMS DO NOT OFFER THE SUBTLE DIAGNOSTIC SKILLS NOR FLEXIBLE RESPONSE STYLES OF EXPERT HUMAN INSTRUCTORS. KNOWLEDGE ENGINEERING METHODS ARE NEEDED THAT CAN IDENTIFY AND DOCUMENT KEY COMPONENTS OF INSTRUCTIONAL EXPERTISE, AT A LEVEL OF SPECIFICITY AND DETAIL THAT WILL SUPPORT DEVELOPMENT OF CBI SYSTEMS THAT ENCOMPASS THAT EXPERTISE. THE PROPOSED STUDY WILL EXAMINE THE FEASIBILITY OF USING CRITICAL DECISION AND CONCEPT MAPPING METHODS OF KNOWLEDGE ELICITATION TO EXTRACT AND DESCRIBE KEY FEATURES OF EXPERT ONE-ON-ONE INSTRUCTION. KNOWLEDGE ELICITATION SESSIONS WILL BE CONDUCTED WITH EXPERT INSTRUCTORS IN TWO DOMAINS (CRITICAL CARE NURSING AND COMPUTER SOFTWARE DEBUGGING). RESULTING DATA WILL FORM THE BASIS OF A TAXONOMY OF INSTRUCTIONAL EXPERTISE. THE STUDY WILL PROVIDE IMPORTANT INFORMATION ON THE FEASIBILITY OF REPRESENTING CRITICAL FEATURES OF SKILLED ONE-ON-ONE INSTRUCTION IN CBI SYSTEMS.

CONCORD ASSOCS INC
10615 ALEMEDA DR

KNOXVILLE, TN 37932
Program Manager: EDWARD CONNELLY
Contract #:
Title: MEASUREMENT OF PERFORMANCE OF ARMY TACTICAL UNITS
Topic #: A90-453 Office: ARI ID #: 42241

THE TRADITIONAL MISSION/TASK DECOMPOSITION METHOD OF ANALYSIS HAS LEAD TO A TASK ORIENTED FOCUS INSTEAD OF A MISSION FOCUS. WHILE A TASK ANALYSIS IS NECESSARY TO DEFINE THE TASKS TO BE PERFORMED, A MISSION FOCUSED MOE DEFINES HOW WELL THOSE TASKS MUST BE PERFORMED TO EFFECTIVELY ACCOMPLISH THE MISSION OBJECTIVES. DESIGN OF TRAINING PROGRAMS TYPICALLY RELIES ON TASK ANALYSES TO SELECT TASKS FOR TRAINING, TO ESTABLISH TRAINING GOALS, AND TO ESTABLISH CRITERION PERFORMANCE LEVELS. TRAINING A TASK TO CRITERION LEVEL, ESTABLISHED AS THOUGH THE TASK IS PERFORMED IN ISOLATION, PRODUCES TASK PERFORMANCE NOT NECESSARILY RELEVANT TO THE MISSION, AND OFTEN REQUIRES CONSIDERABLE ON-THE-JOB TRAINING IN SUBSEQUENT MISSION ORIENTED EXERCISES. A COMPOUNDING OF THE PROBLEM OCCURS WHEN SYSTEMS ARE DESIGNED TO IMPROVE THE TASK PERFORMANCE UNDER THE MISTAKEN BELIEF THAT IMPROVING TASK PERFORMANCE WILL ALWAYS IMPROVE THE UNIT'S MISSION EFFECTIVENESS. TWO HYPOTHESES ARE PROPOSED. ONE IS THAT A UNIT MOE CAN BE BUILT WHICH DISCRIMINATES UNIT EFFECTIVENESS AND EMPLOYS MOLAR PERFORMANCE INDICATORS. THE OTHER HYPOTHESIS IS THAT A SENSITIVE MEASURE CAN BE CONSTRUCTED FROM THE MOE THAT PROVIDES DIAGNOSTIC AND OTHER UNIT TAKE HOME INFORMATION BY ASSESSING THE IMPACT OF THE TASK PERFORMANCE ON OVERALL UNIT EFFECTIVENESS DURING A MISSION.

SAG CORP
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FALLS CHURCH, VA 22046
Program Manager: LEE S MAIRS
Contract #:
Title: OFFICER FORCE STRUCTURE PLANNING MODEL
Topic #: A90-455 Office: ARI ID #: 42242

SAG CORPORATION PROPOSES TO DEVELOP AND ESTIMATE A MODEL OF U.S. ARMY OFFICER RETENTION BEHAVIOR USING A PANEL-PROBIT (ACOL-2) SPECIFICATION TO CONTROL FOR UNOBSERVED HETEROGENEITY. THIS RETENTION EQUATION SERVES AS THE KEYSTONE OF A SUBSEQUENT (PHASE II) OFFICER FORCE STRUCTURE PLANNING MODEL. THE FSPM WILL PROVIDE RELIABLE ESTIMATES OF THE PERSONNEL-FLOW IMPLICATIONS OF POLICY AND ENVIRONMENTAL CHANGES. USEFUL ANALYTICAL TOOLS ARE CRUCIAL IN A PERIOD OF DRASTIC ARMY FORCE STRUCTURE CHANGES. WE OFFER A WELL-STRUCTURED, PROVEN APPROACH TO THE PHASE I RESEARCH, BASED ON EXPERIENCE IN MANY RELATED PROJECTS. TASK 1 LAYS OUT THE MODEL'S THEORETICAL FRAMEWORK, INCLUDING THE SPECIFICATION OF AN ACOL-2 STRUCTURE IN THE UNOBSERVED COMPONENT OF THE ACOL DECISION RULE. TASK 1 ALSO RESOLVES KEY ISSUES SUCH AS DEFINING OFFICER OBLIGATION AND THE RETENTION DECISION POINT. TASK 2 BUILDS THE ESTIMATION MODEL; SELECTS THE APPROPRIATE ESTIMATION METHOD; AND IDENTIFIES AND SPECIFIES DATA. TASK 3 ESTIMATES THE RETENTION EQUATIONS FOR ONE OCCUPATIONAL SPECIALTY. FINALLY, TASK 4 INTERPRETS FINDINGS, AND ASSESSES APPLICABILITY AND ADAPTABILITY TO A PC-BASED FSPM. THE SAG TEAM POSSESSES THE EXPERIENCE AND EXPERTISE NECESSARY TO DESIGN AND ACCOMPLISH A HIGH-QUALITY ANALYSIS OF ARMY OFFICER RETENTION BEHAVIOR.

CONTINENTAL SYSTEMS TECHNOLOGY CORP
2300 WINDY RIDGE PKWY - STE 155 S
MARIETTA, GA 30067
Program Manager: RICHARD A WHITE
Contract #:

Title: MEASUREMENT OF COMBAT PERFORMANCE
Topic #: A90-456 Office: ARI ID #: 42243

THE ULTIMATE GOAL OF THE PROPOSED PROJECT IS TO DETERMINE IF THERE EXISTS WITHIN THE LITERATURE A SUFFICIENT FOUNDATION FOR THE DEVELOPMENT OF PRELIMINARY COMBAT PERFORMANCE MEASURES FOR ARMY ENLISTED SOLDIERS. DETERMINATION WILL BE BASED ON AN ANALYSIS OF a.) IDENTIFIED INDIVIDUAL PERFORMANCE CHARACTERISTICS ASSOCIATED WITH COMBAT, b.) MEASURES CURRENTLY AVAILABLE TO MEASURE THE IDENTIFIED CHARACTERISTICS AND c.) MODELS WHICH EXPLAIN THE RELATIONSHIP BETWEEN THE IDENTIFIED CHARACTERISTICS. THE FINAL REPORT WILL INCLUDE A PLAN FOR THE DEVELOPMENT OF NEEDED MEASURES TO BE CARRIED OUT IN PHASE II.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
Program Manager: C HSU
Contract #:
Title: LOW-COST HIGH QUANTUM EFFICIENCY LONG WAVELENGTH ARRAYS FOR SMART MUNITION
Topic #: A90-457 Office: ARDEC ID #: 42244

RECENT SUCCESSES OF MOLECULAR BEAM EPITAXY (MBE) HAVE DEMONSTRATED GROWTH OF NEW ELECTRONIC MATERIALS AND INFRARED DETECTORS WITH EXCEPTIONAL OR GREATLY IMPROVED PROPERTIES. IN PARTICULAR, MBE CAN PRODUCE A SUPERLATTICE SCHOTTKY BARRIER WITH CONTROLLED BANDGAP AND ULTRA-THIN EPILAYERS TO DETECT LONG WAVELENGTH INFRARED (LWIR) IN THE 8-12 MICRON SPECTRAL RANGE. WE PROPOSE TO DEVELOP AN ARRAY OF THESE SUPERLATTICE SCHOTTKY BARRIER DETECTOR PROCESSED WITH METAL OXIDE FIELD-EFFECT TRANSISTOR (MOSFET) READOUT ELECTRONICS ON SILICON (Si). WE WILL FIRST DEVELOP THE SUPERLATTICE SCHOTTKY BARRIER DETECTORS FOR THE 8-12 MIRO SPECTRAL REGION, AND DEVELOP THE READOUT ELECTRONICS TO INTERFACE THE DETECTORS FORMING A MONOLITHIC ARRAY. WE WILL THEN OPTIMIZE THE ARRAY FOR A QUANTUM EFFICIENCY GREATER THAN 40%, A NON-UNIFORMITY LESS THAN 1% AND A FABRICATION COST AS LOW AS THAT FOR THE CURRENTLY-AVAILABLE Pt-SILICIDE SCHOTTKY BARRIER ARRAY COVERING THE 3 - 5 MICRON SPECTRAL BAND. THE RESULTANT LWIR ARRAYS WILL BE LOW COST AND HIGH PERFORMANCE, AND THEREFORE WILL BE MOST ATTRACTIVE FOR ADVANCED SEEKERS USED IN SMART MUNITIONS IN PROGRAMS SUCH AS SADARM.

AMERICAN GNC CORP
9131 MASON AVE
CHATSWORTH, CA 91311
Program Manager: CHING-FANG LIN
Contract #:
Title: HIGH PRECISION ROBUST ADAPTIVE WEAPON CONTROL SYSTEM DESIGN
Topic #: A90-458 Office: ARDEC ID #: 42245

THE FOLLOWING PROPOSAL COMBINES TWO TECHNICAL INNOVATIONS, A GENERALIZED SINGULAR LINEAR QUADRATIC (GSLQ) ADAPTIVE CONTROL SCHEME AND A CEREBELLAR MODEL ARITHMETIC COMPUTER (CMAC), FOR THE PURPOSE OF ACHIEVING A HIGH PRECISION, ROBUST, ADAPTIVE WEAPON CONTROL SYSTEM DESIGN. THE BENEFITS OF THE RESULTING WEAPON CONTROL SYSTEM ARE SEVERAL: (1) A MULTI-INPUT AND MULTI-OUTPUT (MIMO), ADAPTIVE CONTROL LAW DESIGN; (2) AN ADAPTIVE, MAXIMUM HIGH CONTROL BANDWIDTH WHICH IS A FUNCTION OF THE MAGNITUDE OF THE DISTURBANCE INPUTS AND COMMANDS; (3) THE ELIMINATION OF DETAILED, ACCURATE KNOWLEDGE OF SYSTEM DYNAMIC PARAMETERS SUCH AS MECHANICAL FRICTION AND STRUCTURE RESONANT FREQUENCY, SINCE THE RESULTING CONTROL LAW IS PRINCIPALLY A FUNCTION OF CONTROL ACTION EFFECTIVENESS, WHICH CAN BE DIRECTLY MEASURED ON-LINE; (4) ROBUSTNESS TO A WIDE RANGE OF SYSTEM DYNAMIC PARAMETERS

SUCH AS MECHANICAL FRICTION AND STRUCTURE RESONANT DYNAMICS; AND (5) INCREASED TARGET TRACKING ACCURACY FOR FIRE-ON-THE-MOVE APPLICATIONS. PHASE I FOCUSES ON: (1) DESIGNING A HIGH ACCURACY MIMO ADAPTIVE TURRET WEAPON CONTROL LAW FOR A SPECIFIC WEAPON TURRET CONFIGURATION; AND (2) PERFORMING ANALYSIS AND EVALUATIONS OF THE RESULTING CLOSED-LOOP CONTROL SYSTEMS OVER A WIDELY VARYING VIBRATIONAL ENVIRONMENT, ENSURING HIGH ACCURACY AND GOOD ROBUSTNESS. IN PHASE II, THE EFFECTIVENESS SHALL BE DEMONSTRATED VIA IMPLEMENTATION OF BOTH SOFTWARE AND HARDWARE IN A REAL-TIME ENVIRONMENT. FURTHERMORE, A STANDARDIZED MIMO ADAPTIVE CONTROL IMPLEMENTATION MODULE FOR ADVANCED PRECISION WEAPONS SYSTEMS SHALL BE DEVELOPED. THIS INCLUDES: (1) A SIMPLIFIED ADAPTIVE DIGITAL SERVO CONTROLLER IMPLEMENTATION SCHEME; AND (2) ALL NECESSARY SOFTWARE AND HARDWARE REQUIRED FOR IMPLEMENTATION.

SCIENTIFIC APPLICATIONS & RSCH ASSOCS
15206 TRANSISTOR LN
HUNTINGTON BEACH, CA 92649
Program Manager: DR TIMOTHY M RYNNE
Contract #:
Title: ELECTROMAGNETIC INTERFERENCE (EMI)/ELETRO MAGNETIC PULSE (EMP) HIGH POWER MICROWAVE (HPM) PROTECTION FOR PACKAGED AMMUNITION
Topic #: A90-459 Office: ARDEC ID #: 42246

MODERN BATTLEFIELD CONDITIONS POSE SEVERE ELECTROMAGNETIC ENVIRONMENTS TO MILITARY ELECTRONIC SYSTEMS. SUCH THREATS RANGE FROM ENEMY GENERATED NUCLEAR EMP AND HPMs TO FRIENDLY RADAR AND COMMUNICATION SYSTEM RF RADIATIONS. WHILE THESE THREATS HAVE BEEN INCREASING IN POWER AND FREQUENCY, THE FUZES USED IN MODERN WEAPONS HAVE BEEN INCREASINGLY BASED ON SENSITIVE ELECTRONICS, SUCH AS INTEGRATED CIRCUITS FOR TIMING, RADAR ALTITUDE SENSORS, AND PROXIMITY FUZES. THESE SENSORS, IN CONJUNCATION WITH THEIR ELECTRONIC DETONATORS, MAY BE ACTIVATED BY THE VARIOUS ELECTROMAGNETIC THREATS. THE ISSUES ADDRESSED IN THIS SBIR PROGRAM WILL BE: 1- WHAT LEVEL OF HARDENING IS DESIRED BY THE ARMY FROM THE AMMUNITION CONTAINERS? THIS GIVES GUIDANCE IN THE DETERMINATION OF WHAT TYPE OF MEASURES NEED TO BE TAKEN IN MODIFYING THE CONTAINERS. 2- WHAT IS THE PRESENT SHIELDING EFFECTIVENESS OF THE PRESENT AMMUNITION CASES? IF SOME TYPES OF PRESENT CASES OFFER SIGNIFICANT SHIELDING, THERE MAY NOT BE ANY NEED FOR MODIFYING SUCH CASES. SIMILARITY, KNOWING THE PRESENT SHIELDING EFFECTIVENESS OF PRESENT CASES WILL AID IN IDENTIFYING HARDENING MODIFICATIONS. 3- WHAT TYPE OF MODIFICATIONS CAN BE MADE TO THE CONTAINERS? INCLUDED IN THIS ISSUE ARE THE ADDED QUESTIONS a) WHAT IS THE EFFECTIVENESS OF EACH MODIFICATION AND b) WHAT IS THE COST OF EACH TYPE OF MODIFICATION?

LB&M ASSOCS INC
211 SW "A" AVE
LAWTON, OK 73501
Program Manager: RON W RHOADS
Contract #:
Title: FIRE CONTROL BATTLE MANAGEMENT AND DECISION SUPPORT SYSTEM TECHNOLOGY (DECISION SUPPORT SYSTEM TECHNOLOGY WITHIN EMBEDDED ...)
Topic #: A90-460 Office: ARDEC ID #: 42247

THE OBJECTIVES OF THIS PHASE I WORK ARE TO: DETERMINE THE DESIGN REQUIREMENTS FOR AN EMBEDDED TRAINING SYSTEM. DETERMINE THE MATURITY OF INTELLIGENT TUTORING SYSTEMS FOR INCLUSION IN EMBEDDED TRAINING. DERIVE THE DESIGN FOR AN EMBEDDED TRAINING SYSTEM WHICH INTEGRATES WITH DECISION SUPPORT SYSTEMS TECHNOLOGY. DETERMINE THE FEASIBILITY OF USING A SIMULATION MODULE IN CONJUNCTION WITH EMBEDDED TRAINING AND DECISION SUPPORT SYSTEMS. DETERMINE THE MODIFICATIONS NECESSARY TO INTEGRATE FEEDBACK WITH WEAPONS SYSTEM

DISPLAYS. PHASE I OF THIS PROJECT WILL DELIVER: A DESCRIPTION OF DESIGN ALTERNATIVES FOR AN INTELLIGENT TUTOR. A FUNCTIONAL DESCRIPTION OF THE EMBEDDED TRAINING SYSTEM. A PRELIMINARY SOFTWARE DESIGN FOR A PROTOTYPE SYSTEM. AN ANALYSIS OF THE USER SYSTEM INTERFACE MODIFICATIONS NECESSARY. PAHSE II WILL INCLUDE DOCUMENTATION AND DEVELOPMENT OF: A WORKING PROTOTYPE FOR THE AUTOMATION AND ROBOTICS LABORATORY OF FIRE SUPPORT ARMAMENT CENTER. A TRAINING APPROACH USING SIMULATION MODULE AND THE DECISION SUPPORT SYSTEMS. AN APPROACH FOR TRANSITIONING THE PROTOTYPE SYSTEM INTO THE TARGET AFAS ENVIRONMENT. WORK ON THIS PROPOSAL WILL BUILD ON CURRENT WORK BEING DONE ON RSOP AND SELF DEFENSE DECISION SUPPORT SYSTEM. AS A RESULT OF THE PHASE I AND PHASE II EFFORTS, THE ARMY WILL HAVE REQUIRED DESIGN PARAMETERS FOR COMPLETE DEVELOPMENT OF AN EMBEDDED TRAINING SYSTEM, A PROTOTYPE IN THE AUTOMATION AND ROBOTICS LABORATORY OF FIRE SUPPORT ARMAMENT CENTER, AND AN APPLICATION OF INTELLIGENT TUTORING TECHNOLOGY.

ONTAR CORP
129 UNIVERSITY RD
BROOKLINE, MA 02146
Program Manager: DR JOHN SCHROEDER
Contract #:
Title: ADVANCED SIGNAL PROCESSING METHODS FOR SMART MUNITIONS SEEKERS
Topic #: A90-461 Office: ARDEC ID #: 42248

THE U.S. ARMY, THROUGH THE ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER (ARDEC), HAS A REQUIREMENT TO DEVELOP WEAPONS SYSTEMS FOR THE DETECTION AND IDENTIFICATION OF GROUND VEHICLE TARGETS IN A CLUTTER ENVIRONMENT. AUTONOMOUS HOMING MUNITIONS (AHM) USING INFRARED, VISIBLE, MILLIMETER WAVE AND OTHER SENSOR SYSTEMS ARE BEING INVESTIGATED FOR *THIS APPLICATION. ADVANCED SIGNAL PROCESSING AND* COMPUTATIONAL APPROACHES USING PATTERN RECOGNITION AND ARTIFICIAL INTELLIGENCE TECHNIQUES COMBINED WITH MULTISENSOR TECHNOLOGY HAVE THE POTENTIAL TO MEET THE ARMY'S REQUIREMENTS FOR NEXT GENERATION AHM. THE ONTAR CORPORATION HAS DEVELOPED AND IMPLEMENTED A RIGOROUS ANALYTICAL METHODOLOGY AND WORKSTATION SOFTWARE PACKAGE TO CHARACTERIZE GROUND/AIR TARGETS AND BACKGROUND CLUTTER FOR AUTOMATIC TARGET QUEING AND RECOGNITION (ATC & ATR) APPLICATIONS. STATISTICAL PATTERN RECOGNITION TECHNIQUES HAVE BEEN USED TO ANALYZE SEVERAL SCENES DATABASES, AND DERIVE A SET OF DISCRIMINATION ALGORITHMS FOR TARGET DETECTION, CLASSIFICATION, AND IDENTIFICATION.

OPTICS 1 INC
4035 THOUSAND OAKS BLVD - STE 105
WESTLAKE VILLAGE, CA 91362
Program Manager: MARK H BANDHAUER
Contract #:
Title: OPTICAL DESIGN FOR ENHANCING LASER EYE PROTECTION
Topic #: A90-462 Office: ARDEC ID #: 42249

CONVENTIONAL OPTICAL SIGHTS ARE NOT PRESENTLY DESIGNED WITH INTERNAL IMAGE QUALITY OR ENERGY DENSITY AT THE INTERNAL IMAGE AS PRIMARY CONSTRAINTS. USUALLY, IF THE SYSTEM PRESENTS A SUFFICIENT IMAGE TO THE USERS EYE, THEN THE SIGHT IS CONSIDERED ACCEPTABLE. WITH THE USE OF LASERS AS A COUNTERMEASURE IN A COMBAT ENVIRONMENT, THE PROBLEM OF LASER EYE DAMAGE BECOMES A CRUCIAL ISSUE. APPROPRIATE PRECAUTIONS MUST BE TAKEN TO REDUCE THIS RISK FOR THE USERS OF OPTICAL SIGHTS. BY USING NONLINEAR OPTICAL METHODS SUCH AS SACRIFICIAL MIRRORS AND PLASMA FORMATION, INCOMING LASER RADIATION CAN BE BLOCKED FROM THE USER'S EYES. THESE TECHNIQUES REQUIRE A CERTAIN ENERGY DENSITY AT THE INTERNAL IMAGE IN ORDER FOR THE OPTICAL LIMITERS TO ACTIVATE. IN THIS SBIR WE WILL DESIGN AND ENGINEER AN IMPROVED SIGHT WITH A SUFFICIENTLY HIGH ENERGY DENSITY AT THE INTERNAL FOCUS IN ADDITION TO THE OVERALL

IMAGING PERFORMANCE AT A LEVEL COMMENSURATED WITH PRESENT SYSTEMS.

McDONALD R A INC
9400 TOPANGA CANYON BLVD
CHATSWORTH, CA 91311
Program Manager: JARAL DELVAPASIN
Contract #:
Title: SMALL CALIBER PRIMER AUTOMATED INSPECTION SYSTEM
Topic #: A90-463 Office: ARDEC ID #: 42250

A SYSTEM UTILIZING THE COMPANY'S RAM 200 VISION MACHINE IS DESCRIBED. IT PROVIDES A NON-CONTACT ON-LINE NON-OPERATOR DEPENDENT INSPECTION SYSTEM FOR SMALL CALIBER PRIMER. THE HARDWARE CONSISTS OF A MACHINE VISION SYSTEM INCLUDING LIGHTS CAMERAS, ETC., UTILIZING ULTRA HIGH SPEED ECL GATE ARRAY TEMPLATE MATCHING TOGETHER WITH EQUIPMENT TO HANDLE THE PRIMERS THROUGH THE INSPECTION PROCESS. PRIMERS TO BE INSPECTED WILL FIRST BE ORIENTED BY THE HANDLING EQUIPMENT AND THEN PASSED UNDER THIS SYSTEM'S CAMERAS. DEFECTIVE PRIMERS WILL BE MARKED FOR AUTOMATIC REJECTION LATER. THE PRIMERS WILL THAN BE AUTOMATICALLY TURNED OVER AND THE INSPECTION REPEATED. SUBSEQUENTLY MARKED PRIMERS WILL BE REJECTED. IT IS ANTICIPATED THAT ONE RAM 200 VISION MACHINE WILL BE CAPABLE OF HANDLING, USING A MULTI-CAMERA SET UP THE ENTIRE 2.1 MILLION DAILY PRIMER INSPECTIONS WITHIN AN EIGHT HOUR PERIOD.

MMT INC
120-D RESEARCH DR
MILFORD, CT 06460
Program Manager: RICHARD F CHENEY
Contract #:
Title: HEAVY ALLOYS FOR RAPIDLY SOLIDIFIED ALLOY POWDERS
Topic #: A90-464 Office: ARDEC ID #: 42893

A PROGRAM IS PROPOSED TO SHOW THE FEASIBILITY OF MAKING RAPIDLY SOLIDIFIED TUNGSTEN ALLOYS FOR USE IN ARMOR PENETRATORS. PLASMA RAPID SOLIDIFIED PROCESSING WILL BE USED TO PRODUCE SEVERAL ALLOY POWDERS, WHICH WILL BE DENSIFIED AND EVALUATED. GREATLY IMPROVED MECHANICAL PROPERTIES ARE EXPECTED.

MMT INC
120-D RESEARCH DR
MILFORD, CT 06460
Program Manager: RICHARD F CHENEY
Contract #:
Title: RAPID SOLIDIFICATION PROCESSING OF TUNGSTEN ALLOYS
Topic #: A90-464 Office: ARDEC ID #: 50322

A PROGRAM IS PROPOSED TO SHOW THE FEASIBILITY OF MAKING RAPIDLY SOLIDIFIED TUNGSTEN ALLOYS FOR USE IN ARMOR PENETRATORS. PLASMA RAPID SOLIDIFICATION PROCESSING WILL BE USED TO PRODUCE SEVERAL ALLOY POWDERS, WHICH WILL BE COMPACTED, SINTERED, AND EVALUATED. GREATLY IMPROVED MECHANICAL PROPERTIES ARE EXPECTED.

COMPUTER SENSING SYSTEMS
6169 ST ANDREWS RD - STE 308
COLUMBIA, SC 29212

Program Manager: JOHN W GORMAN
Contract #:
Title: SENSOR-BASED SERVO CONTROL FOR A MOBILE ROBOT MANIPULATOR
Topic #: A90-465 Office: ARDEC ID #: 42253

THIS PROPOSAL ADDRESSES THE UNIQUE AND INNOVATIVE CONCEPT OF SENSOR-BASED SERVO CONTROL FOR A ROBOT MANIPULATOR MOUNTED ON A MOBILE PLATFORM. SUCH CONTROL IS NECESSARY TO ENABLE A MOBILE MANIPULATOR TO APPROACH AND GRASP OR PLACE OBJECTS IN THE WORK ENVIRONMENT. SENSOR-BASED FEEDBACK IS REQUIRED TO OVERCOME THE UNCERTAINTIES IN POSITION AND ORIENTATION WHICH EXIST FOR BOTH THE MOBILE ROBOT AND THE OBJECTS. IN THIS PROPOSAL, CONCEPTS FOR THE DEVELOPMENT OF A KINEMATIC MODEL AND A CONTROL ALGORITHM FOR THE MOBILE MANIPULATOR WILL BE PRESENTED. AN IMPORTANT FEATURE OF THE CONTROL ALGORITHM WILL BE THE INTEGRATION OF SENSOR DATA. DEVELOPMENT OF A SENSOR-BASED SERVO CONTROL ALGORITHM FOR A MOBILE ROBOTIC MANIPULATOR IS OF GREAT SIGNIFICANCE. THE UNCERTAINTY ASSOCIATED WITH MOBILITY RENDERS ANY ATTEMPT AT OBJECT MANIPULATION UNCERTAIN AT BEST. SENSOR-BASED SERVO CONTROL WILL MAKE SUCH MANIPULATIONS POSSIBLE. USING THIS CONTROL SCHEME, MOBILE ROBOTS WILL BE ABLE TO FUNCTION IN DYNAMIC AND UNCERTAIN ENVIRONMENTS. THIS WILL ENABLE THE ROBOTS TO SERVE IN HAZARDOUS SETTINGS AND TO ADAPT TO EVOLVING MISSIONS AND SURROUNDINGS. IN AN INDUSTRIAL SETTING, THIS TECHNOLOGY WOULD PERMIT A ROBOT TO SERVE AS A ROVING SERVICE VEHICLE, ABLE TO PERFORM TASKS AT DIVERSE LOCATIONS THROUGHOUT A FACILITY.

PECHT ASSOCS INC
4407 BEECHWOOD RD
HYATTSVILLE, MD 20782
Program Manager: JUDY PECHT
Contract #:
Title: EFFECTS OF LONG-TERM STORAGE ON ELECTRONIC DEVICES
Topic #: A90-467 Office: ARDEC ID #: 42254

THE PURPOSE OF THIS PROJECT IS TO IDENTIFY FAILURE MECHANISMS AND STRESSES ASSOCIATED WITH LONG-TERM STORAGE OF ELECTRONIC DEVICES, TO IDENTIFY COST EFFECTIVE PACKAGING TECHNIQUES FOR PROTECTING ELECTRONIC DEVICES DURING LONG-TERM STORAGE AND TO ASSESS NEW TECHNOLOGIES AND DESIGN METHODS FOR PROTECTING ELECTRONIC DEVICES DURING LONG-TERM STORAGE. THIS STUDY WILL LAY THE FOUNDATION FOR THE PHASE II PROJECT WHICH INVOLVES DEVELOPING GUIDELINES SPECIFICALLY FOR THOSE CRITICAL ELECTRONICS LOCATED IN INFRARED (IR), MILLIMETER WAVE (MMW) SENSORS, AND ASSOCIATED SMART MUNITION ELECTRONICS. THE KEY FACTOR IS TO DETERMINE FAILURE MECHANISMS DUE TO STORAGE CONDITIONS AND COST EFFECTIVE PACKAGING METHODS FOR PROTECTION. THIS REQUIRES THE INVESTIGATION OF THE VARIOUS PHYSICS OF FAILURE MECHANISMS AND MODES OF FAILURE FOR ELECTRONIC MATERIALS AND DEVICES.

ENSCO INC
5400 PORT ROYAL RD
SPRINGFIELD, VA 22151
Program Manager: JOHN PERRY
Contract #:
Title: DIGITAL X-RAY IMAGE VIEWING AND ANALYSIS SYSTEM
Topic #: A90-468 Office: ARDEC ID #: 42255

THE PRIMARY OBJECTIVE OF THIS PROPOSED EFFORT IS TO DEVELOP A PROTOTYPE IMAGE VIEWING SYSTEM THAT CAN RECOVER, DUPLICATE AND DISPLAY ARCHIVED X-RAY IMAGERY AND ANALYSIS DATA OF MUNITIONS ITEMS. THE SYSTEM IS DESIGNED TO BE EXTENSIBLE SO THAT IN THE PHASE II EFFORT AN

IMAGE ANALYSIS OPTION CAN BE EASILY INTEGRATED INTO THE OVERALL SYSTEM. THE IMAGE ANALYSIS OPTION WILL BE DESIGNED TO SIMULATE THE AUTOMATED X-RAY INSPECTION SYSTEM CURRENTLY USED BY THE ARMY. OUR DESIGN WILL BE VERSATILE ENOUGH TO ALLOW THE USER TO UTILIZE THE SYSTEM IN VARIOUS MODES AND CONFIGURATIONS. FOR EXAMPLE, AS WELL AS HAVING THE CAPABILITY OF IMAGE ANALYSIS, THE SYSTEM SHOULD HAVE THE ABILITY TO PERFORM OTHER PERSONAL COMPUTER TASKS, SUCH AS WORD PROCESSING, SPREADSHEETS, GRAPHICS, PROJECT MANAGEMENTS, ETC. FURTHER, THIS "DUAL MODE" OPERATION SHOULD ALLOW EACH TASK TO BE FULLY FUNCTIONAL. THE SYSTEM SHOULD ALSO ALLOW VARIOUS CONFIGURATIONS OF HARDWARE TO BE INTEGRATED AMONG EACH OTHER, OR SEPARATELY, DEPENDING ON THE FUNCTIONALITY REQUIRED BY THE USERS OF THE SYSTEM OR THE SPECIFIC HARDWARE COMPONENTS AVAILABLE FOR INTEGRATION.

MEGADYNE CORP
8718 ARLINGTON BLVD
FAIRFAX, VA 22031
Program Manager: MARC RODY
Contract #:
Title: ELECTRONIC SAFE AND ARM FOR HIGH VELOCITY/ACCELERATION PROJECTILES
Topic #: A90-469 Office: ARDEC ID #: 42256

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP AND BUILD A HARDWARE PROTOTYPE OF AN ELECTRONIC SAFE AND ARM (ESA) FOR HIGH VELOCITY/ ACCELERATION PROJECTILES. THE HARDWARE PROTOTYPE SYSTEM WILL DEMONSTRATE THE DESIGN FOR THE HIGH VOLTAGE CONVERTER, TRIGGER CIRCUIT AND INTERFACE TO A SLAPPER DETONATOR AND SENSORS. IN ADDITION, THE PROTOTYPE WILL DEMONSTRATE SYSTEM SAFETY, ENVIRONMENTAL AND PACKAGING CONCEPTS FEASIBILITY. THE SYSTEM ELECTRONICS WILL INCLUDE A CONVERTER, ENERGY STORAGE CAPACITOR, HIGH VOLTAGE SWITCH, ACCELEROMETERS, AND ENERGY PATH SWITCHES. THE VARIABLE Q, CLASS E, DC/DC HIGH VOLTAGE CONVERTER OPERATES AT A FREQUENCY OF APPROXIMATELY 1 MHz CAPABLE OF DELIVERING 25 WATTS AT 80% EFFICIENCY. THE ESA WILL BE DESIGNED TO ULTIMATELY FIT INTO A 1.25 INCH DIAMETER BY 2 INCH HIGH TENSILE, STEEL TUBE WITH FORE AND AFT CLOSURES. A 6 CONDUCTOR, 3 LAYER COPPER KAPTON RIBBON CABLE WILL PROVIDE AN INTERFACE. KEY TECHNICAL ADVANTAGES OF THE SPECIFIC DESIGN ARE THE ESA WILL WITHSTANDING UP TO 75,000 Gs AND WITHSTAND FULL ENVIRONMENTAL CONDITIONS. THE INNOVATIVE DESIGN OF THE ESA WILL CREATE A UNIT THAT IS EMI/RFI/ESD RESISTANT AND WILL WORK OVER A WIDE TEMPERATURE RANGE.

GMA INDUSTRIES INC
PO BOX 345
ATLANTIC HIGHLAND, NJ 07716
Program Manager: R GLENN WRIGHT
Contract #:
Title: EXPERT SYSTEM VERIFICATION AND VALIDATION PARADIGM DEVELOPMENT
Topic #: A90-470 Office: ARDEC ID #: 42257

THE PROPOSED RESEARCH WILL RESULT IN THE DEVELOPMENT OF EXPERT SYSTEM VERIFICATION AND VALIDATION PARADIGMS, IMPLEMENTED THROUGH A HANDBOOK AND AUTOMATED TOOL APPROACH, WHICH MAY BE USED THROUGHOUT THE EXPERT SYSTEM LIFE CYCLE. THIS WILL BE ACCOMPLISHED THROUGH DETAILED ANALYSIS AND COMPARISON OF EXPERT SYSTEM AND CONVENTIONAL SOFTWARE DEVELOPMENT PRACTICES AND STANDARDS, DETERMINATION OF DIFFERENCES, AND GENERATION OF NEW AND ADAPTATION OF EXISTING VERIFICATION AND VALIDATION TECHNIQUES. CONCURRENT ENGINEERING AND DESIGN FOR TESTABILITY TECHNIQUES SPECIFICALLY TAILORED TO THE FIELD OF ARTIFICIAL INTELLIGENCE WILL FORM A SIGNIFICANT PORTION OF OUR APPROACH. THESE RESULTS WOULD BE INCORPORATED INTO A SUITE OF HANDBOOKS AND AUTOMATED TOOLS TO ASSIST IN ACCOMPLISHING VERIFICATION AND VALIDATION. RULE-BASED, MODEL-BASED, AND HYBRID EXPERT

SYSTEM REQUIREMENTS WILL BE ADDRESSED, AS WILL THE VARIOUS FEATURES OF THESE SYSTEMS, INCLUDING INTERFACES TO DATABASE SYSTEMS, EXTERNAL PROGRAMS AND ROUTINES, USER INTERFACES, EXPLANATION AND TRACE FACILITIES. RECOMMENDATIONS FOR IMPLEMENTING THE RESULTS OF THIS RESEARCH, INCLUDING POSSIBLE AREAS FOR CONSIDERATION FOR STANDARDIZATION, WILL ALSO BE DEVELOPED AND PRESENTED.

M L ENERGIA INC
PO BOX 1468
PRINCETON, NJ 08542
Program Manager: DR MOSHE LAVID
Contract #:
Title: HIGH SPEED METHOD OF PRIMER DRYING
Topic #: A90-471 Office: ARDEC ID #: 42258

A NOVEL IDEAL TO DRAMATICALLY REDUCE DRYING TIME OF PRIMER PELLETS IS PROPOSED. CURRENT FORCED AIR CONVECTION DRYING IS LIMITED BY LOW CONDUCTIVE HEAT TRANSFER TO THE PELLET INTERIOR AND INADEQUATE WATER DIFFUSIVITY TO THE PELLET SURFACE. EMPLOYMENT OF ELECTROMAGNETIC RADIATION (EMR) CYCLES CAN SUBSTANTIALLY INCREASE THE DRYING RATE BY INCREASING PELLET INTERNAL TEMPERATURE, THEREBY IMPROVING HEAT TRANSFER AND MASS DIFFUSIVITY. THE COMBINED EMR-CONVECTION TECHNIQUE HAS PROVEN EFFECTIVE IN REDUCING DRYING TIMES FOR A NUMBER OF MATERIALS, INCLUDING HEAT-SENSITIVE SUBSTANCES. FURTHERMORE, IT AVOIDS THE DANGERS OF DECOMPOSITION AND AUTOIGNITION ATTENDANT WITH OPERATING PURE FORCE-AIR CONVECTION AT FREE-STREAM TEMPERATURES. THE UNDERLYING OBJECTIVE OF PHASE I IS TO EVALUATE THE FEASIBILITY OF COMBINED EMR-CONVECTION DRYING OF PRIMER PELLETS. THE PROPOSED WORK PLAN IS DIVIDED INTO FOUR TASKS: DESIGN AND CONSTRUCTION OF A VERSATILE LABORATORY TEST APPARATUS, MEASUREMENT OF DRYING CURVES UNDER PURE FORCED CONVECTION, DRYING STUDIES ON COMBINED EMR-CONVECTION AT A SINGLE FREQUENCY AND, IF NEEDED, EVALUATION OF ALTERNATIVE EMR FREQUENCIES. THE MEASURE OF PHASE I SUCCESS WILL BE TO ACHIEVE AN AVERAGE PRIMER PELLET DRYING TIME OF LESS THAN FIVE MINUTES, IN A LABORATORY-SCALE CHAMBER. IF FEASIBILITY IS PROVEN, PHASE II R&D WILL LEAD TO PROTOTYPE DEVELOPMENT, SCALE-UP AND PHASE III COMMERCIALIZATION.

GORHAM ADVANCED MATERIALS INSTITUTE
PO BOX 250
GORHAM, ME 04038
Program Manager: EDWIN S HODGE
Contract #:
Title: POWDERED METAL PREFORMS FOR BARREL LINERS
Topic #: A90-472 Office: ARDEC ID #: 42259

RECENT IMPROVEMENTS IN HOT ISOSTATIC PRESSING TECHNIQUES HAVE ALLOWED AN AUSTRIAN COMPANY TO SUPPLY FULL LENGTH LINERS MADE FROM NIMONIC 105 TO A SWISS GUN MANUFACTURER. THESE TECHNIQUES HAVE BEEN UTILIZED IN THE U.S. FOR LINING OF TUBES FOR THE CHEMICAL AND NUCLEAR INDUSTRIES AND FOR LINING OF VALVES FOR WEAR AND EROSION RESISTANCE. THIS TECHNOLOGY, BASE UPON COLD AND HOT ISOSTATIC PRESSING TECHNIQUES, WILL BE DEVELOPED FOR THE SPECIFIC MATERIALS OF INTEREST USING STAFF, EQUIPMENT, AND INNOVATIVE TECHNOLOGY TO PRODUCE A SUPERIOR MATERIAL IN THE RIFLED BARREL SECTION WITHOUT AN UNACCEPTABLE COST IMPACT. TWO BASIC APPROACHES COULD BE USED TO ACCOMPLISH THE END OBJECTIVE. THE FIRST APPROACH WOULD BE TO FABRICATE THE LINER AS REQUESTED BY ISOSTATIC PROCESSING, MACHINE THE LINER, SHRINK FIT THE LINER INTO THE CONVENTIONAL BARREL, AND HEAT TREAT. THE SECOND APPROACH WOULD INVOLVE PROCESSING IN A PIGGY-BACK FASHION BARREL-LINER COMPOSITE SPECIMENS IN A COST EFFECTIVE MANNER. THIS APPROACH WOULD BE TO SIMULTANEOUSLY FABRICATE THE LINER AND BOND IT TOP THE BARREL TO AVOID MACHINING TO CLOSE TOLERANCES, INSERTION AND SHRINK

FITTING OF THE LINER, AND POSSIBLY THE FINAL HEAT TREATMENT. THIS APPROACH PERMITS LOWER FABRICATION TEMPERATURES, GRAIN SIZE CONTROL AND PERMITS IMPROVED MICRO- STRUCTURAL CONTROL. THE COST ANALYSIS WOULD COMPARE BOTH APPROACHES WITH THE CURRENT FABRICATION COSTS AND BENEFITS.

MARTINGALE RESEARCH CORP
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ALLEN, TX 75002
Program Manager: ROBERT L DAWES
Contract #:
Title: PARAMETER ESTIMATION AND TRACKING OF MANEUVERING TARGETS WITH THE PARAMETRIC AVALANCHE
Topic #: A90-473 Office: ARDEC ID #: 42260

WE PROPOSE TO SOLVE TWO IMPORTANT PROBLEMS IN THE TRACKING OF MANEUVERING TARGETS IN DYNAMIC IMAGERY. THE FIRST IS THE COMPUTATIONAL COMPLEXITY OF THE STOCHASTIC FILTER, E.G., THE KALMAN FILTER; AND THE SECOND IS THE USE OF TARGET SHAPE AND ORIENTATION TO ENHANCE TRACKING PERFORMANCE THROUGH VIOLENT MANEUVERS. OUR PROPOSAL INVOLVES A CASCADED CONFIGURATION OF OUR PROPRIETARY PARAMETRIC AVALANCHE NEUROCOMPUTING ARCHITECTURE, WHICH IS A MASSIVELY PARALLEL IMPLEMENTATION OF THE CONTINUOUS TIME BAYESIAN ESTIMATOR BASED ON THE INNOVATIONS METHOD OF T. KAILATH AND THE PRINCIPLE OF QUANTUM NEURODYNAMICS OF R. DAWES. THE PHASE I PROJECT WILL RESULT IN COMPUTER SIMULATIONS OF SMALL BUT NONTRIVIAL NETWORKS OF PARAMETRIC AVALANCHE MODULES TO TEST AN IMPORTANT THEORETICAL CAPABILITY OF SUCH NETWORKS, NAMELY, TO FACTOR IMPUT SIGNALS INTO STOCHASTICALLY ORTHOGONAL SUBSPACE REPRESENTATIONS. THIS WILL IN TURN DEMONSTRATE BOTH THE COMPUTATIONAL EFFICIENCY OF THE METHOD AND ITS ABILITY TO USE ABSTRACT INFORMATION, SUCH AS TARGET SHAPE, FOR THE IMPROVEMENT OF CONCRETE ESTIMATES, SUCH AS THE TARGET TRAJECTORY.

TECHNICAL SOLUTIONS INC
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MESILLA PARK, NM 88047
Program Manager: GEORGE C OBER
Contract #:
Title: COMPUTER MODEL FOR INDIRECT FIRE CONTROL SYSTEM SIMULATOR
Topic #: A90-474 Office: ARDEC ID #: 42261

AN OPPORTUNITY EXISTS TO DEVELOP A COMPREHENSIVE ANALYTICAL SIMULATION OF FIRE CONTROL PROCESSES OF INDIRECT FIRE. THE INVESTIGATOR WILL BE ABLE TO DEVELOP BOTH STANDARD AND CONCEPTUAL FIRE CONTROL SYSTEMS AND EVALUATE THEIR EFFECTIVENESS IN A USER DEFINED THREAT ENVIRONMENT. AS A RESULT OF THE ADVANCES OF TECHNOLOGY IN THE AREAS OF COMPUTER ARCHITECTURES AND GRAPHICS, AS WELL AS THE INCREASED APPLICATION OF EXPERT AND KNOWLEDGE-BASED SYSTEMS CONCEPTS TO COMPLEX PROBLEMS, THE DEVELOPMENT OF AN INTEGRATED INDIRECT FIRE SIMULATION ON A PC BASED COMPUTER IS WELL WITHIN THE REALM OF FEASIBILITY. THIS WOULD PROVIDE THE USER THE CAPABILITY TO CHARACTERIZE A FIRE CONTROL SYSTEM AND EVALUATE THE PROCESSES AT GIVEN NODES OF THE SIMULATION UNTIL FINAL EFFECTS ON THE TARGET HAVE BEEN DETERMINED. THE PROPOSED EFFORT WILL COMPLEMENT THE FIELD ARTILLERY AFAS EFFORT. AS CURRENTLY CONCEIVED, ONLY TECHNICAL FIRE CONTROL IS BEING EMBEDDED INTO THE AFGAS AND TACTICAL FIRE CONTROL IS TO BE CONDUCTED AT PLATOON OR HIGHER. IN ADDITION, THIS EFFORT WILL PROVIDE A USABLE TOOL TO ASSIST THE FIELD ARTILLERY AND OTHER AGENCIES IN DEFINING THOSE AREAS IN DELIVERY OF INDIRECT FIRE THAT WILL GENERATE THE BEST CHANCE OF DELIVERING ACCURACY AND EFFECTIVE FIRES.

PRINCETON SCIENTIFIC INSTRUMENTS INC
7 DEER PARK DR
MONMOUTH JUNCTION, NJ 08852
Program Manager: JOHN L LOWRANCE
Contract #:
Title: SIGHT INTEGRATION OF AN AUTOMATIC MUZZLE REFERENCE SYSTEM
Topic #: A90-475 Office: ARDEC ID #: 42262

A TANK CANNON GUN BARREL BENDS UNDER THE INFLUENCE OF TANK MOTION, SOLAR HEATING, AND DURING AND AFTER FIRING ROUNDS OF AMMUNITION. BY DETECTING THE RESULTANT ANGULAR MOTION OF THE MUZZLE RELATIVE TO THE TRUNNION IN REAL TIME THE FIRE CONTROL SYSTEM CAN CORRECT THESE SIGNIFICANT SOURCES OF POINTING ERROR. THE SUBJECT STUDY IS TO INVESTIGATE THE BEST MEANS FOR AUTOMATICALLY AND CONTINUOUSLY MEASURING MUZZLE ANGLE AND INTEGRATING SUCH AN AUTOMATIC MUZZLE REFERENCE SYSTEM, (AMRS), INTO THE COORDINATE SYSTEM OF THE GUNNER'S PRIMARY SIGHT BALLISTIC COMPUTER SYSTEM. THE STUDY ALSO CONSIDERS MEANS FOR AUTOMATING THE MANUAL MUZZLE BORESIGHTING CURRENTLY REQUIRED OF THE GUNNER.

ELECTROMAGNETIC APPLICATIONS INC (EMA)
64 SUMNER ST
NEWTON, MA 02159
Program Manager: CARMINE VITTORIA
Contract #:
Title: INFLUENCE OF PULSED MAGNETIC FIELDS ON UNIAXIAL STRESS OF FILMS
Topic #: A90-476 Office: ARO ID #: 42263

WE PROPOSE A SPECIFIC PROCEDURE BY WHICH PULSED MAGNETIC FIELDS ARE APPLIED TO RELIEVE STRESS IN AMORPHOUS MAGNETIC FILMS OF Fe B Si IN AN INITIAL INVESTIGATION. THE ADVANTAGE OF THIS MAGNETIC FILM SYSTEM IS THAT IT EXHIBITS A WELL DEFINED UNIAXIAL STRESS AXIS AND THE MICROSTRUCTURE, MAGNETIC AND MECHANICAL PROPERTIES ARE WELL CHARACTERIZED. IN OUR PROCEDURE A PULSED MAGNETIC FIELD IS APPLIED ALONG AND NORMAL TO THE STRESS AXIS. STRESS AMPLITUDE AND AXIS DIRECTION ARE MEASURED AS A FUNCTION OF ANNEALING FIELD AMPLITUDE, TEMPERATURE AND PULSE TIME DURATION. A THEORETICAL MODEL INVOLVING THE COUPLING OF MAGNETIC FIELD TO THE LOCAL MICROSTRUCTURE (VIA MAGNETOSTRICTION) OF THE FILM WILL BE DEVELOPED TO EXPLAIN THE STRESS RELIEF MECHANISM IN AMORPHOUS MAGNETIC FILMS.

ADVANCED TECHNOLOGY MATERIALS INC
520-B DANBURY RD
NEW MILFORD, CT 06776
Program Manager: DELWYN CUMMINGS
Contract #:
Title: TITANIUM CARBIDE-GRAPHITE COMPOSITES
Topic #: A90-477 Office: ARO ID #: 42264

THE HIGH TEMPERATURE STRENGTH OF CERAMIC MATERIALS MAKE THEM ATTRACTIVE FOR USE IN HIGH EFFICIENCY COMBUSTION ENGINES. UNFORTUNATELY, THE POOR FRICTION AND WEAR PROPERTIES OF COMMON CERAMICS OFTEN PRECLUDE THEIR USE IN ROTATING AND SLIDING COMPONENTS. SOLID STATE LUBRICANTS ARE A POTENTIAL SOLUTION TO THIS TRIBOLOGICAL PROBLEM BUT THEY ARE USUALLY INCOMPATIBLE WITH OXIDE-BASED CERAMICS. A TITANIUM CARBIDE-GRAPHITE COMPOSITE COMBINES THE HIGH TEMPERATURE STRENGTH AND HARDNESS OF TITANIUM CARBIDES WITH THE LUBRICITY OF GRAPHITE. A NOVEL MELT FABRICATION TECHNIQUE IS PROPOSED WHICH YIELDS A FULLY DENSE MATERIAL WITH CONTROL OVER THE SIZE, SHAPE AND ORIENTATION OF THE GRAPHITE INCORPORATED IN THE TITANIUM CARBIDE MATRIX. IN PHASE I WE PROPOSE TO PRODUCE THREE DIFFERENT TITANIUM

CARBIDE-GRAPHITE BASED COMPOSITES, MEASURE THEIR FRICTION AND WEAR PROPERTIES AT 25 AND 900 DEG C, AND DETERMINE THEIR COMPRESSIVE STRENGTH. IN PHASE II PROTOTYPE ROTATING AND SLIDING COMPONENTS WILL BE MANUFACTURED AND TESTED.

OCEAN SYSTEMS RESEARCH INC
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ANNAPOLIS, MD 21401
Program Manager: DR KENT T S TZOU
Contract #:
Title: TIME ACCURATE WALL SHEAR STRESS TRANSDUCERS
Topic #: A90-478 Office: ARO ID #: 42265

THE ABILITY TO ACCURATELY DETERMINE WALL SHEAR STRESS AT DISCRETE POINTS ALONG A FLOW SURFACE IS VITAL FOR THE SOLUTION OF MANY COMPLEX PROBLEMS IN AERODYNAMICS AND FLUID MECHANICS. EXISTING SHEAR STRESS MEASUREMENT TECHNIQUES RELY PRIMARILY ON INDIRECT MEASUREMENTS OF PARAMETERS SUCH AS FLUID VELOCITY OR PRESSURE WHICH ARE THEN CONVERTED TO SHEAR STRESS VALUES. FOR UNSTEADY SEPARATED FLOWS AND OR TURBULENT FLOWS, HOWEVER, THESE EXISTING METHODS SIMPLY DO NOT HAVE SUFFICIENT TEMPORAL RESOLUTION FOR TIME-ACCURATE WALL SHEAR STRESS MEASUREMENTS. THIS PROPOSAL ADDRESSES THE DESIGN, FABRICATION, AND TESTING OF SMALL (APPROXIMATELY 0.25 INCHES), RUGGED, NON-INTRUSIVE, LOW COST TRANSDUCERS THAT WILL BE CAPABLE OF DIRECTLY MEASURING UNSTEADY WALL SHEAR STRESS. THE PROPOSED TRANSDUCERS WILL HAVE A HIGH ENOUGH FREQUENCY RESPONSE AND SENSITIVITY TO MEASURE SHEAR STRESS FLUCTUATIONS ON THE ORDER OF 6 x 10(-7) psi IN REAL TIME IN TWO DIMENSIONS.

IMPLANT SCIENCES CORP
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Program Manager: STEPHEN N BUNKER
Contract #:
Title: REFRACTORY MATERIALS COATING PROCESSES STRONGLY ADHERENT CERAMIC SURFACE LAYERS BY ION IMPLANTATION
Topic #: A90-479 Office: ARO ID #: 42266

REFRACTORY COATINGS ARE IMPORTANT FOR PROTECTING VULNERABLE SUBSTRATES FROM EXTREME ENVIRONMENTS. HOWEVER, ADHESION OF COATINGS DURING EXTREMES OF THERMAL CYCLING AND CORROSION LIMIT THE APPLICATIONS. INCONSISTENCIES BETWEEN PROPERTIES, SUCH AS CHEMICAL STABILITY AND LOW FRICTION VERSUS ADHESION, MAKE THE SUCCESSFUL DESIGN OF USEFUL COATINGS QUITE DIFFICULT. A METHOD IS PROPOSED TO USE A NEW TYPE OF ION IMPLANTATION TECHNOLOGY TO IMPLANT A CERAMIC SURFGACE INTO AN ARBITRARY SUBSTRATE AND TO MAKE THICK LAYERS. ADHESION SHOULD BE EXCELLENT, EVEN FOR OXIDES, AND NORMAL CONCERNS ABOUT THERMAL EXPANSION MATCHING, IMPURITIES, AND CHEMICAL COMPATIBILITY SHOULD NOT APPLY. SAMPLES WILL BE FABRICATED AND TESTED AS A DEMONSTRATION.